OMB Number: 2030-0020
Expiration Date: 06/30/2024

Preaward Compliance Review Report for All Applicants and Recipients Requesting EPA Financial Assistance

Note: Read Instructions before completing form.

I. A. Applicant/Recipient (Name, Address, City, State, Zip Code)

Name: Red Lake Band of Chippewa Indians

Address: 15484 Migizi Drive

City: Red Lake

State: MN: Minnesota

Zip Code: 56671

B. DUNS No. 0786834060000

II. Is the applicant currently receiving EPA Assistance? ☒ Yes ☐ No

III. List all civil rights lawsuits and administrative complaints pending against the applicant/recipient that allege discrimination based on race, color, national origin, sex, age, or disability. (Do not include employment complaints not covered by 40 C.F.R. Parts 5 and 7.)

N/A

IV. List all civil rights lawsuits and administrative complaints decided against the applicant/recipient within the last year that allege discrimination based on race, color, national origin, sex, age, or disability and enclose a copy of all decisions. Please describe all corrective actions taken. (Do not include employment complaints not covered by 40 C.F.R. Parts 5 and 7.)

N/A

V. List all civil rights compliance reviews of the applicant/recipient conducted by any agency within the last two years and enclose a copy of the review and any decisions, orders, or agreements based on the review. Please describe any corrective action taken. (40 C.F.R. § 7.80(c)(3))

N/A

VI. Is the applicant requesting EPA assistance for new construction? If no, proceed to VII; if yes, answer (a) and/or (b) below.

☐ Yes ☒ No

a. If the grant is for new construction, will all new facilities or alterations to existing facilities be designed and constructed to be readily accessible to and usable by persons with disabilities? If yes, proceed to VII; if no, proceed to VI(b).

☐ Yes ☐ No

b. If the grant is for new construction and the new facilities or alterations to existing facilities will not be readily accessible to and usable by persons with disabilities, explain how a regulatory exception (40 C.F.R. 7.70) applies.

VII. Does the applicant/recipient provide initial and continuing notice that it does not discriminate on the basis of race, color, national origin, sex, age, or disability in its program or activities? (40 C.F.R 5.140 and 7.95) ☒ Yes ☐ No

a. Do the methods of notice accommodate those with impaired vision or hearing? ☒ Yes ☐ No

b. Is the notice posted in a prominent place in the applicant's offices or facilities or, for education programs and activities, in appropriate periodicals and other written communications? ☒ Yes ☐ No

c. Does the notice identify a designated civil rights coordinator? ☐ Yes ☒ No

VIII. Does the applicant/recipient maintain demographic data on the race, color, national origin, sex, age, or handicap of the population it serves? (40 C.F.R. 7.85(a)) ☐ Yes ☒ No

IX. Does the applicant/recipient have a policy/procedure for providing access to services for persons with limited English proficiency? (40 C.F.R. Part 7, E.O. 13166) ☐ Yes ☒ No

X. If the applicant is an education program or activity, or has 15 or more employees, has it designated an employee to coordinate its compliance with 40 C.F.R. Parts 5 and 7? Provide the name, title, position, mailing address, e-mail address, fax number, and telephone number of the designated coordinator.

Yes. Sharon L Norris
Human Resources Director
PO Box 546
Red Lake Nation Government Center
15484 Migizi Drive
Red Lake MN 56671
(218)679-1473

XI. If the applicant is an education program or activity, or has 15 or more employees, has it adopted grievance procedures that assure the prompt and fair resolution of complaints that allege a violation of 40 C.F.R. Parts 5 and 7? Provide a legal citation or Internet Address for, or a copy of, the procedures.

Yes. https://www.redlakenation.org/human-resources/

For the Applicant/Recipient

I certify that the statements I have made on this form and all attachments thereto are true, accurate and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine or imprisonment or both under applicable law. I assure that I will fully comply with all applicable civil rights statutes and EPA regulations.

A. Signature of Authorized Official	B. Title of Authorized Official	C. Date
Shane Bowe	Tribal Chairman	03/25/2022

For the U.S. Environmental Protection Agency

I have reviewed the information provided by the applicant/recipient and hereby certify that the applicant/recipient has submitted all preaward compliance information required by 40 C.F.R. Parts 5 and 7; that based on the information submitted, this application satisfies the preaward provisions of 40 C.F.R. Parts 5 and 7; and that the applicant has given assurance that it will fully comply with all applicable civil rights statures and EPA regulations.

A. *Signature of Authorized EPA Official	B. Title of Authorized Official	C. Date

*** See Instructions**

Instructions for EPA FORM 4700-4 (Rev. 06/2014)

General. Recipients of Federal financial assistance from the U.S. Environmental Protection Agency must comply with the following statutes and regulations.
Title VI of the Civil Rights Acts of 1964 provides that no person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. The Act goes on to explain that the statute shall not be construed to authorize action with respect to any employment practice of any employer, employment agency, or labor organization (except where the primary objective of the Federal financial assistance is to provide employment). Section 13 of the 1972 Amendments to the Federal Water Pollution Control Act provides that no person in the United States shall on the ground of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under the Federal Water Pollution Control Act, as amended. Employment discrimination on the basis of sex is prohibited in all such programs or activities. Section 504 of the Rehabilitation Act of 1973 provides that no otherwise qualified individual with a disability in the United States shall solely by reason of disability be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. Employment discrimination on the basis of disability is prohibited in all such programs or activities. The Age Discrimination Act of 1975 provides that no person on the basis of age shall be excluded from participation under any program or activity receiving Federal financial assistance. Employment discrimination is not covered. Age discrimination in employment is prohibited by the Age Discrimination in Employment Act administered by the Equal Employment Opportunity Commission. Title IX of the Education Amendments of 1972 provides that no person in the United States on the basis of sex shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance. Employment discrimination on the basis of sex is prohibited in all such education programs or activities. Note: an education program or activity is not limited to only those conducted by a formal institution. 40 C.F.R. Part 5 implements Title IX of the Education Amendments of 1972. 40 C.F.R. Part 7 implements Title VI of the Civil Rights Act of 1964, Section 13 of the 1972 Amendments to the Federal Water Pollution Control Act, and Section 504 of The Rehabilitation Act of 1973. The Executive Order 13166 (E.O. 13166) entitled; "Improving Access to Services for Persons with Limited English Proficiency" requires Federal agencies work to ensure that recipients of Federal financial assistance provide meaningful access to their LEP applicants and beneficiaries.

Items "Applicant" means any entity that files an application or unsolicited proposal or otherwise requests EPA assistance. 40 C.F.R. §§ 5.105, 7.25. "Recipient" means any entity, other than applicant, which will actually receive EPA assistance. 40 C.F.R. §§ 5.105, 7.25. "Civil rights lawsuits and administrative complaints" means any lawsuit or administrative complaint alleging discrimination on the basis of race, color, national origin, sex, age, or disability pending or decided against the applicant and/or entity which actually benefits from the grant, but excluding employment complaints not covered by 40 C.F.R. Parts 5 and 7. For example, if a city is the named applicant but the grant will actually benefit the Department of Sewage, civil rights lawsuits involving both the city and the Department of Sewage should be listed. "Civil rights compliance review" means any review assessing the applicant's and/or recipient's compliance with laws prohibiting discrimination on the basis of race, color, national origin, sex, age, or disability. Submit this form with the original and required copies of applications, requests for extensions, requests for increase of funds, etc. Updates of information are all that are required after the initial application submission. If any item is not relevant to the project for which assistance is requested, write "NA" for "Not Applicable." In the event applicant is uncertain about how to answer any questions, EPA program officials should be contacted for clarification. * Note: Signature appears in the Approval Section of the EPA Comprehensive Administrative Review For Grants/Cooperative Agreements & Continuation/Supplemental Awards form.

Other Attachment File(s)

*** Mandatory Other Attachment Filename:** 1235-Section 8 - Optional Attachments.pdf

Add Mandatory Other Attachment | Delete Mandatory Other Attachment | View Mandatory Other Attachment

To add more "Other Attachment" attachments, please use the attachment buttons below.

Add Optional Other Attachment | Delete Optional Other Attachment | View Optional Other Attachment

OMB Number: 2030-0020
Expiration Date: 06/30/2024

EPA KEY CONTACTS FORM

Authorized Representative: *Original awards and amendments will be sent to this individual for review and acceptance, unless otherwise indicated.*

Name: Prefix: First Name: Darrell Middle Name:
Last Name: Seki Suffix: Sr.

Title: Tribal Chairman

Complete Address:

Street1: 15484 Migizi Drive
Street2:
City: Red Lake State: MN: Minnesota
Zip / Postal Code: 56671 Country: USA: UNITED STATES

Phone Number: 218-679-3341 **Fax Number:**

E-mail Address: dseki@redlakenation.org

Payee: *Individual authorized to accept payments.*

Name: Prefix: First Name: Brenda Middle Name:
Last Name: Kolling Suffix:

Title: Director of Finance

Complete Address:

Street1: 15484 Migizi Drive
Street2:
City: Red Lake State: MN: Minnesota
Zip / Postal Code: 56671 Country: USA: UNITED STATES

Phone Number: 218-679-3341 **Fax Number:**

E-mail Address: bkolling@redlakenation.org

Administrative Contact: *Individual from Sponsored Programs Office to contact concerning administrative matters (i.e., indirect cost rate computation, rebudgeting requests etc).*

Name: Prefix: First Name: Jennifer Middle Name:
Last Name: Malinski Suffix:

Title: Environmental Specialist

Complete Address:

Street1: 15761 High School Drive
Street2:
City: Red Lake State: MN: Minnesota
Zip / Postal Code: 56671 Country: USA: UNITED STATES

Phone Number: 218-679-1618 **Fax Number:**

E-mail Address: jmalinski@redlakenation.org

EPA Form 5700-54 (Rev 4-02)

EPA KEY CONTACTS FORM

Project Manager: *Individual responsible for the technical completion of the proposed work.*

Name: Prefix:
First Name: Jennifer
Middle Name:
Last Name: Malinski
Suffix:

Title: Environmental Specialist

Complete Address:

Street1: 15761 High School Drive
Street2:
City: Red Lake
State: MN: Minnesota
Zip / Postal Code: 56671
Country: USA: UNITED STATES

Phone Number: 218-679-1618
Fax Number:

E-mail Address: jmalinski@redlakenation.org

Project Narrative File(s)

*** Mandatory Project Narrative File Filename:** 1234-ARP Grant.pdf

Add Mandatory Project Narrative File | Delete Mandatory Project Narrative File | View Mandatory Project Narrative File

To add more Project Narrative File attachments, please use the attachment buttons below.

Add Optional Project Narrative File | Delete Optional Project Narrative File | View Optional Project Narrative File

OMB Number: 4040-0004
Expiration Date: 12/31/2022

Application for Federal Assistance SF-424

* 1. Type of Submission:	* 2. Type of Application:	* If Revision, select appropriate letter(s):
☐ Preapplication	☒ New	
☒ Application	☐ Continuation	* Other (Specify):
☐ Changed/Corrected Application	☐ Revision	

* 3. Date Received: 03/25/2022
4. Applicant Identifier:

5a. Federal Entity Identifier:
5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:
7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: Red Lake Band of Chippewa Indians

* b. Employer/Taxpayer Identification Number (EIN/TIN): 41-0692381
* c. Organizational DUNS: 0786834060000

d. Address:

* Street1: 15484 Migizi Drive
Street2:
* City: Red Lake
County/Parish:
* State: MN: Minnesota
Province:
* Country: USA: UNITED STATES
* Zip / Postal Code: 56671-0279

e. Organizational Unit:

Department Name: Dept. of Natural Resources
Division Name: Environmental Program

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:
* First Name: Jennifer
Middle Name:
* Last Name: Malinski
Suffix:

Title:

Organizational Affiliation:

* Telephone Number: 218-679-1618
Fax Number:

* Email: jmalinski@redlakenation.org

Application for Federal Assistance SF-424

*** 9. Type of Applicant 1: Select Applicant Type:**

I: Indian/Native American Tribal Government (Federally Recognized)

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

Environmental Protection Agency

11. Catalog of Federal Domestic Assistance Number:

66.034

CFDA Title:

Surveys, Studies, Research, Investigations, Demonstrations, and Special Purpose Activities Relating to the Clean Air Act

*** 12. Funding Opportunity Number:**

EPA-OAR-OAQPS-22-01

* Title:

Enhanced Air Quality Monitoring for Communities

13. Competition Identification Number:

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Add Attachment | Delete Attachment | View Attachment

*** 15. Descriptive Title of Applicant's Project:**

Ozone Monitoring on the Red Lake Reservation

Attach supporting documents as specified in agency instructions.

Add Attachments | Delete Attachments | View Attachments

Application for Federal Assistance SF-424

16. Congressional Districts Of:

* a. Applicant: 7 & 8
* b. Program/Project: 7 & 8

Attach an additional list of Program/Project Congressional Districts if needed.

[ ] Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 01/01/2023
* b. End Date: 12/31/2025

18. Estimated Funding ($):

* a. Federal	67,500.00
* b. Applicant	0.00
* c. State	0.00
* d. Local	0.00
* e. Other	0.00
* f. Program Income	0.00
* g. TOTAL	67,500.00

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

☐ a. This application was made available to the State under the Executive Order 12372 Process for review on [ ].

☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.

☒ c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

☐ Yes ☒ No

If "Yes", provide explanation and attach

[ ] Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix:
* First Name: Darrell

Middle Name:

* Last Name: Seki

Suffix: Sr.

* Title: Tribal Chairman

* Telephone Number: 218-679-3341
Fax Number: 218-679-3378

* Email: dseki@redlakenation.org

* Signature of Authorized Representative: Shane Bowe
* Date Signed: 03/25/2022

BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 02/28/2022

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Enhanced Air Quality Monitoring for Communities	66.034	$ 67,500.00	$	$	$	$ 67,500.00
2.						
3.						
4.						
5. Totals		$ 67,500.00	$	$	$	$ 67,500.00

Standard Form 424A (Rev. 7- 97)
Prescribed by OMB (Circular A -102) Page 1

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1) Enhanced Air Quality Monitoring for Communities	(2)	(3)	(4)	Total (5)
a. Personnel	$ 8,415.00	$	$	$	$ 8,415.00
b. Fringe Benefits	3,702.00				3,702.00
c. Travel	316.00				316.00
d. Equipment	47,263.00				47,263.00
e. Supplies	1,925.00				1,925.00
f. Contractual	0.00				0.00
g. Construction	0.00				0.00
h. Other	4,274.00				4,274.00
i. Total Direct Charges (sum of 6a-6h)	65,895.00				$ 65,895.00
j. Indirect Charges	1,605.00				$ 1,605.00
k. TOTALS (sum of 6i and 6j)	$ 67,500.00	$	$	$	$ 67,500.00
7. Program Income	$	$	$	$	$

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Prescribed by OMB (Circular A -102) Page 1A

SECTION C - NON-FEDERAL RESOURCES				
(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8. Enhanced Air Quality Monitoring for Communities	$	$	$	$
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	$	$	$	$

SECTION D - FORECASTED CASH NEEDS					
	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 57,690.00	$ 54,000.00	$ 1,230.00	$ 1,230.00	$ 1,230.00
14. Non-Federal	$				
15. TOTAL (sum of lines 13 and 14)	$ 57,690.00	$ 54,000.00	$ 1,230.00	$ 1,230.00	$ 1,230.00

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT				
(a) Grant Program	FUTURE FUNDING PERIODS (YEARS)			
	(b)First	(c) Second	(d) Third	(e) Fourth
16. Enhanced Air Quality Monitoring for Communities	$ 4,905.00	$ 4,905.00	$	$
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$ 4,905.00	$ 4,905.00	$	$

SECTION F - OTHER BUDGET INFORMATION	
21. Direct Charges:	22. Indirect Charges: 19.07% of salary
23. Remarks:	

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Manifest for Grant Application # GRANT13580093

Grant Application XML file (total 1):

1. GrantApplication.xml. (size 22464 bytes)

Forms Included in Zip File(total 6):

1. Form ProjectNarrativeAttachments_1_2-V1.2.pdf (size 16013 bytes)

2. Form SF424_3_0-V3.0.pdf (size 24217 bytes)

3. Form SF424A-V1.0.pdf (size 22810 bytes)

4. Form EPA4700_4_3_0-V3.0.pdf (size 22750 bytes)

5. Form OtherNarrativeAttachments_1_2-V1.2.pdf (size 16000 bytes)

6. Form EPA_KeyContacts_2_0-V2.0.pdf (size 37298 bytes)

Attachments Included in Zip File (total 2):

1. OtherNarrativeAttachments_1_2 OtherNarrativeAttachments_1_2-Attachments-1235-Section 8 - Optional Attachments.pdf application/pdf (size 6235809 bytes)

2. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1234-ARP Grant.pdf application/pdf (size 1086358 bytes)

Red Lake Band of Chippewa Indians

Enhanced Air Quality Monitoring for Communities Grant Work Plan
EPA-OAR-OAQPS-22-01

Project Title: Ozone Monitoring on the Red Lake Reservation

Applicant Information:

Organization: Red Lake Band of Chippewa Indians
Address: 15484 Migizi Drive, Red Lake, MN 56671
Primary Contact: Jennifer Malinski
Red Lake Department of Natural Resources (RL DNR)
15761 High School Drive Red Lake, MN 56671
(218) 679-1618 jmalinski@redlakenation.org
DUNS Number: 078683406

Set-Aside: Tribal set-aside

Description of Applicant Organization: The Red Lake Nation, with its unique lineage of Ojibwe people, will protect, preserve, and maintain its status as an independent nation that is federally recognized as an Indian tribe, which possesses all the powers of a Sovereign Nation. On behalf of all Red Lake Band members, the Red Lake Tribal Council is committed to maintaining and conducting its affairs in a manner that is aligned with the expectations of our ancestors, elders, tribal members, and future generations. With support from the Red Lake Tribal Council, the Red Lake Department of Natural Resources and Air Program will work to ensure that future generations will continue to have the resources to live as sovereign people.

Project Partners: Minnesota Pollution Control Agency (MPCA), Kurt Anderson
Red Lake Department of Natural Resources (RL DNR), Al Pemberton

Project Location: The Red Lake Indian Reservation and the State of Minnesota

Air Pollutant Scope: Ozone

Budget Summary:

EPA Funding Requested	Total Project Cost
$67,500.00	$67,500.00

Project Period: January 2023 – December 2025

Short Project Description: Purchase, install, and begin operating an ozone monitor on the Red Lake Reservation, filling a gap in monitoring that exists in the region. Make near real-time ozone AQI data and alerts available to Red Lake Nation and others via AirNow.gov, smogwatch.com, and enviroflash.info. Strengthen Tribal-State relationships, increase awareness of ground-level ozone in the environment, and reduce human exposure to ozone resulting in improved health.

PROPOSED WORK PLAN

This project supports EPA's Goals and Objectives as described within EPA's Draft Fiscal Year (FY) 2022-2026 Strategic Plan. Specifically, this project meets: Goal 4, "Ensure Clean and Healthy Air for All Communities;" Objective 4.1, "Improve Air Quality and Reduce Localized Pollution and Health Impacts."

The Reservation has three principal management areas primarily based on geographical characteristics as shown in Figure 1, Appendix A. The Diminished Reservation portion is the main contiguous block encompassing over 650,000 acres. The term stems from treaty history and means that it has never been ceded to the U.S. government by treaty. The other two regions are lands that had been ceded to the U.S. government by treaty but subsequently restored to the Band. The larger contiguous portion of these two is located on the Northwest Angle. The remainders are commonly referred to as the "Ceded Lands," which includes the lands scattered between the Diminished Reservation and the Angle. This project focuses primarily on the Diminished Reservation, where the Red Lake Reservation's communities are located and where the monitor will be sited, but has wider implications.

<u>Section 1 – Proposed Summary and Approach</u>

A. Overall Project

Work Plan Components (See schedule in Section *4C*)

a. **Purchase and Install Ozone Monitor**

Since the Red Lake Band's monitoring site is expected to become part of the MPCA's network and primary quality assurance organization (PQAO), as has been done with Red Lake's PM2.5 monitor, efforts will be made to purchase equipment that is identical to what the MPCA operates.

<u>Task 1 Get quote(s):</u> Quotes for an ozone monitor (including all necessary components) will be obtained in the spring of 2023. Either three written quotes will be obtained, as required by the Red Lake Procurement Policies and Procedures Manual for purchases from $5,001 to $50,000 (Resolution No. 165-97), or sole source justification will be made.

<u>Task 2 Order monitor:</u> An ozone monitor, including all necessary components, will be ordered in the spring of 2023.

<u>Task 3 Finalize site selection:</u> A site location will be finalized in the spring of 2023 for the ozone monitor taking into consideration: requirements for equipment operation (electric hookup, space needed inside building and proximity to roof/upper level, etc.) and QA/QC, noise from equipment, accessibility, site security, etc. The site location's Administrative and Maintenance staff will be consulted.

<u>Task 4 Install monitor:</u> Ozone monitor installation will occur in the summer of 2023. MPCA will assist with this process.

b. **Ozone Monitor Operation and Maintenance**

The ozone monitor will operate continuously from March 1 through October 31 of each year, which is considered the standard "ozone monitoring season" in Minnesota.

Task 1 Training: MPCA will provide on-site ozone monitor training following equipment installation.

Task 2 Weekly/Monthly checks and maintenance: An automated Precision/Zero/Span (PZS) check will occur each weekend and will take about an hour. PZS check recordkeeping is automated, records will be kept and maintained by MPCA. Filter changes will occur monthly and will be documented in logbooks.

Task 3 Calibrations: The ozone monitor will be calibrated every 60 days by MPCA, either remotely or in person. Calibrations would be scheduled for February, April, June, August, and October. Calibrations will be documented in logbooks. Records will also be kept and maintained by MPCA.

Task 4 Audits: Two audits will be completed each year. Audits will be documented in logbooks. Records will also be kept and maintained by MPCA.

Task 5 Annual maintenance: MPCA will complete annual maintenance with help from the RL DNR Air Program. Additionally, once per year the calibrator will be transported to MPCA's Air Lab located in St. Paul, MN to get evaluated against a secondary standard. These events will be documented in logbooks.

Task 6 QAPP review: Review MPCA's *Quality Assurance Project Plan: Monitoring for O_3, NO_2, SO_2, CO PM_{10}, $PM_{10\text{-}2.5}$ and Lead* document's ozone related information annually to help ensure that it is still accurate and kept up to date accordingly.

c. **Make Ozone Data Publicly Available**

Task 1 Data release document: Submit data release document to Chairman's office for signature.

Task 2 Join MPCA network and PQAO: Give MPCA approval to add site to their network.

Task 3 Advertise AirNow, Smogwatch, and EnviroFlash websites: Use social media, the RL DNR Newsletter and other news sources to bring attention to the new ozone data available for the region through AirNow.gov, smogwatch.com, and enviroflash.info.

d. **Reporting**

Task 1 Quarterly reports: Quarterly progress reports will be submitted (schedule established by EPA if grant is awarded).

Task 2 Final report: A detailed final report will be submitted within 120 days of completion of the period of performance.

B. Project Significance:

According to the 2016 Red Lake Emissions Inventory, there are 106 facilities contributing to point source emissions within a 50-mile buffer zone around the Diminished Reservation boundary. Looking at ozone precursors emitted, two of the facilities within this Point Source Emissions Area accounted for 69% of the NO_x emissions. The American Crystal Sugar – Crookston facility was the largest source of

NO_x, emitting 717 tons in 2014, or 58% NO_x emissions in the Point Source Emissions Area. The Norbord Minnesota facility near Solway emitted 136 tons of NO_x in 2014, or 11% of NO_x emitted in the Point Source Emissions Area. NO_x emissions from these two facilities are above the EPA point source reporting threshold of 100 tons per year. American Crystal Sugar was also one of the largest sources of VOC emissions within the Point Source Emissions Area. The top two sources accounted for 68% of the total VOC emissions. American Crystal Sugar - Crookston was the largest source of VOC emitting 573 tons in 2014. This amount was 53% of all VOC emitted by point sources in the Point Source Emissions Area. The Marvin Windows & Doors facility in Warroad emitted 169 tons of VOC in 2014, or 16% of VOC in the Point Source Emissions Area. VOC emissions from these facilities are above the EPA point source reporting threshold of 100 tons per year.

Additional emissions sources (nonpoint, non-road mobile, and on-road mobile) of NO_x and VOCs within the 50-mile buffer zone around the Diminished Reservation that are of note include: biogenic emissions from vegetation, railroad equipment, prescribed burning of forests and residential wood combustion, agricultural equipment, and recreational equipment.

Important emissions sources of NO_x and VOCs on the Diminished Reservation include: on-road mobile sources, annual prescribed burns, liquefied petroleum gas burning for residential heating, wood burning for residential heating, distillate oil burning for residential heating, open burning of municipal waste, structure fires, gasoline service stations, and wastewater treatment lagoons.

Although sources of ozone precursors are abundant both on and near Red Lake's Diminished Reservation, ozone monitoring has never before been done on the Reservation due to the prohibitive costs of establishing a site. This project will fill a gap in ozone monitoring in the region. In so doing, it will address the lack of available local information that individuals and communities can use to reduce exposure and public health impacts of ozone by making local AQI values and more accurate air quality alerts publicly available.

This is important to the communities on the Red Lake Reservation because they are historically underserved and because many individuals in these communities are vulnerable to air pollutants, including ozone, due to high potential risk of asthma and heart disease (according to the EPA's Environmental Justice Screening and Mapping Tool EJScreen). However, Tribal communities will not be the only beneficiaries of improved modeling, forecasting, and AQI data and alerts available for the region, as all interested regional entities will benefit as well. This project would allow individuals and communities to use ozone data made available online to reduce exposure and public health impacts of air pollution.

Section 2 – Community Involvement

A. Community Partnerships

Operating a regulatory monitor at this location will improve modeling and forecasting of ozone levels and the AQI in the region. This will allow the Tribe and the State to better communicate pollution and related risks to the citizens of Red Lake and Minnesota. This project offers both organizations an opportunity to collaborate and extend their reach and impact.

Project Partnership Roles and Responsibilities		
Partner	Activities & Associated Roles	Resources Contributed & Expertise
MPCA		
	Finalize site selection: confirm all siting criteria are met **Install monitor:** assist RL DNR **Monitor operation and maintenance:** on-site training of RL DNR staff, perform calibrations every 60 days, complete annual maintenance and audits, keep and maintain records of PZS checks, and audits **Make data publicly available:** make arrangements for site to become part of MPCA's network and PQAO	**Resources:** staff time, technical expertise and assistance, funding (travel to and from site for installation, calibrations, audits, and maintenance), experience (on-site training) **Expertise:** ozone monitor operation and maintenance, data management and validation
RL DNR		
	Ozone Monitor Acquisition: get quotes, order equipment, facilitate payment (funding for purchasing will be provided by EPA as part of this grant) **Finalize site selection:** confirm all siting criteria are met with assistance from MPCA **Install monitor:** set up monitor and all related equipment in an accessible and easy to maintain manner, include building maintenance and administrative staff in discussion if necessary **Monitor operation and maintenance:** assist with annual maintenance, keep and maintain records in site and analyzer logbooks **QAPP review:** review document to maintain relevance and accuracy **Make data publicly available:** advertise websites where data will be available **Grant reporting:** submit quarterly and final reports **Project oversight:** ensure that project stays on course and is completed as specified by submitted schedule	**Resources:** staff time, experience operating and maintaining air monitoring equipment **Expertise:** grant management and project oversight (see Section *8B*)

This project will benefit each partner involved in the following ways:

- MPCA: ozone monitoring at this location will fill a gap within their monitoring network which will make forecasting, modeling, alerts more accurate.
- RL DNR: ozone monitoring at this location will help address an air quality concern within the Red Lake Reservation communities and allow for growth of air monitoring capabilities of the Air Program.

Since the MPCA and RL DNR are in regular contact and are already collaborating on a separate long-term monitoring project (working together to monitor PM2.5 since 2014), it will be easy for this relationship to be maintained well after the 3-year timeframe of this grant has expired. Regular contact will continue as calibrations, audits, and maintenance visits are scheduled into the future. See Section *8A*.

B. Community Engagement

In March of 2018, the RL DNR and a staff member from Red Lake's Indian Health Services teamed up to present information to the Red Lake Middle School classes about the Air Quality Index (AQI), continuous PM2.5 sampling being done in the community, and the School Flag Program. Flags for this program were turned over to the teachers hosting the event. The program currently relies on near real-time AQI PM2.5 data (available on the AirNow.gov website) for its location, but would also be able to use ozone data if it were available. Since the AQI is calculated for four major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution, carbon monoxide, and sulfur dioxide, it would benefit the flag program to have a more inclusive view of air quality in the area by including ozone values in the AQI.

A Community Air Survey was completed in 2021 by people living on the Red Lake Reservation to gain a better understanding of what air quality issues are of most concern, and ultimately to help shape the RL DNR's Air Program. In terms of outdoor air quality issues, 41% of people that returned the survey were concerned about ozone. In addition, 15% were concerned with idling vehicles, 39% were concerned with highway and other traffic emissions, and 68% were concerned with wildfire/prescribed fire smoke, all of which can contribute to ground-level ozone by creating ozone precursors. These preliminary findings about ambient air concerns indicate that ozone and its precursors are an important issue within the Reservation communities that should be addressed by the RL DNR through the Air Program.

As part of the MPCA network, this monitor's near real-time ozone AQI data and alerts will be made available to the Red Lake Nation and others via AirNow.gov, smogwatch.com, and enviroflash.info. Data will be shared with the public on these websites from the beginning of the project (as soon as possible after the equipment has been deployed) to well after the 3-year timeframe of this funding opportunity.

Section 3 – Environmental Justice and Underserved Communities

The Red Lake Indian Reservation, located in north central Minnesota, is one of two closed reservations in the United States, and contains the largest land base in USEPA Region 5 that is entirely under Tribal ownership. The Red Lake Band owns more than 55% of all Indian land in Region 5, and total land holdings comprise over 837,000 acres of which Upper and Lower Red lakes comprise 235,388 acres. Approximately 43% of the tribe's 16,207 enrolled members live on the reservation.

The Reservation is a historically underserved community with inadequate access to healthy food, safe homes and educational opportunities. Poverty and unemployment are widespread at Red Lake. Any project serving the tribal community is furthering environmental justice goals. This project specifically addresses a lack of air quality information that could directly impact the health and well-being of tribal members.

Many individuals living on the Reservation are vulnerable to air pollutants, including ozone, due to health disparities such as high potential risk of asthma and heart disease (EJScreen). 95-100% of Minnesota's population has an equal or lower potential for exposure/risk/proximity to ozone than the people living on the Reservation (Figure 2, Appendix A). For both asthma and heart disease, 95-100% of the US population has an equal or lower potential for risk than the people living on the Reservation (Figures 3 and 4, Appendix A).

Section 4 – Environmental Results – Outcomes, Outputs and Performance Measures

A. Expected Project Outputs and Outcomes

Outputs

1. **Near real-time ozone monitoring data available to the public**
   Near real-time ozone AQI data and alerts available to the public, accessed via AirNow.gov, smogwatch.com, and enviroflash.info.

2. **Summary of data provided in RL DNR Newsletter**
   A summary of ozone data will be provided in the RL DNR Newsletter (seasonally) to ensure everyone in the community has access to the data, even those without internet. Information about ozone sources such as ionic air purifiers may also be included.

3. **Improved AQI data/maps**
   Filling the existing data gap will improve the regional ozone network allowing for more accurate modeling, forecasting, and air quality alerts.

4. **Quarterly Reports and Final Report**
   Regular Quarterly Reports and a Final Report will be submitted to the EPA to track the overall progress of the project, including progress on expenditures and purchases.

Outcomes

1. **Strengthen Tribal relationship/involvement with State Agency**
   Providing data to the state where there is an existing data gap increases the value of the existing partnership with the state and ensures it is a two-way relationship.

2. **Increased awareness of ozone in the environment and potential health effects**
   An increase in the number of people signed up for Red Lake air quality alerts and an increase of awareness that ozone is a health threat.

3. **Reduction of human exposure to ozone resulting in improved health**
   Individuals and communities can use more accurate ozone data to reduce exposure and public health impacts of air pollution.

B. Performance Measures and Plan

1. **Project period equipment operation and maintenance** – This monitoring will establish a baseline against which we will be able to measure changes in ozone over time and will allow for near-real time data to be available to the public. All data from this monitor will be verified as a result of the site being part of the MPCA's PQAO. Audit records will be kept by the MPCA, RL DNR and will be submitted along with quarterly reports.

2. **Data Available on Public Websites –** MPCA will provide the means for ozone data to be made available to the public via AirNow.gov, smogwatch.com, and enviroflash.info.

3. **Data Presented in RL DNR Newsletter –** The RL DNR Air Program will summarize ozone data to be published in the RL DNR Newsletter on a seasonal basis.

4. **Quarterly Reports and Final Report** – The Red Lake DNR will submit regular Quarterly Reports and a Final Report to allow EPA to track the overall progress of the project, including progress on expenditures and purchases. Reports will measure progress against the Timeline in Section *4C*.

5. **Post-project period equipment operation and maintenance –** After the close of this grant period, long-term general maintenance costs (replacement filters, repairs, etc.) will be covered by EPA 105 Tribal Air Grant funding. Operation and maintenance will continue to be provided by the RL DNR Air Program. As a partner for this project, MPCA has agreed to continue providing resources to ensure proper operation and maintenance of the monitor, even after the 3-year timeframe of this funding opportunity has come to a close. MPCA commitments will include annual audits, technical support, and providing a means for the monitoring data to be made available to the public via AirNow.gov, smogwatch.com, and enviroflash.info.

C. Timeline and Milestones

Milestone Schedule		2023										2024 & 2025										2026
Work plan component/task		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Jan
Purchase and Install Ozone Monitor																						
	Task 1 Get quote(s)																					
	Task 2 Order monitor																					
	Task 3 Finalize site selection																					
	Task 4 Install monitor																					
Ozone Monitor Operation and Maintenance																						
	Task 1 Training																					
	Task 2 Wk/mo checks & maintenance																					
	Task 3 Calibrations																					
	Task 4 Audits																					
	Task 5 Annual maintenance																					
	Task 6 QAPP review																					
Make Ozone Data Publicly Available																						
	Task 1 Data release document																					
	Task 2 Join MPCA network/PQAO																					
	Task 3 Advertise websites																					
Reporting																						
	Task 1 Quarterly Reports																					
	Task 2 Final Report																					

Section 5 – Quality Assurance Statement

As part of MPCA's PQAO, ozone monitoring will follow guidelines as described in the MPCA's *Quality Assurance Project Plan: Monitoring for O_3, NO_2, SO_2, CO PM_{10}, $PM_{10\text{-}2.5}$ and Lead* (QAPP) (Appendix B). This document will be reviewed annually and modifications will be submitted as necessary to accomplish project goals.

Section 6 – Programmatic Capability and Past Performance

Red Lake DNR programs have been successfully fulfilling grant requirements since the early 1980's and the Red Lake DNR Air Quality Program has been successfully fulfilling grant requirements since 2007 when the program began. Some examples of our federally funded assistance agreements are Section 105 EPA Clean Air Act, Bureau of Indian Affairs (BIA) water grants, and EPA 104(b)3 Wetland Program Development Grants. Volkswagen Diesel Emissions Environmental Mitigation Trust funding has also been managed and agreements fulfilled.

Several of the RL DNR programs are funded primarily via EPA grants, including the Red Lake DNR Air Program, which is funded primarily through the EPA CAA 105 grant. Quarterly and semi-annual progress reports are submitted to EPA ensuring that the program is sufficiently progressing toward the goals in the work plan. Annual reports are submitted to track both work plan and environmental progress. Both work plan and environmental results progressed as expected in the past 3 years of grant funding. Program staff that have 10+ years each of experience and many years of capacity building within each program have contributed to the successful management and completion of funding agreements.

A. Past Performance

EPA 105 Tribal Air Grant:
All work plan components under the EPA 105 Grant for the Red Lake DNR Air Quality Program have been completed successfully. All reporting requirements have been fulfilled during the grant periods. Final reports have been submitted as appropriate.

Volkswagen Diesel Emissions Environmental Mitigation Trust for Indian Tribe Beneficiaries (Rounds 2 and 3 of funding):
All work plan components under the Indian Tribe Trust for the Red Lake DNR Air Quality Program have been completed successfully. All reporting requirements have been fulfilled during the grant periods. Final reports have been submitted as appropriate.

EPA 106 CWA Grant
All work plan components under the EPA 106 Grant for the Red Lake DNR Waters and Wetlands Program have been completed successfully. All reporting requirements have been fulfilled during the grant periods. Annual water assessment reports have been submitted in a timely manner and approved by EPA.

BIA Water Grants
All work plan components under the BIA Water Grants for the Red Lake DNR Waters and Wetlands Program have been completed successfully. All reporting requirements have been fulfilled during the grant periods. Final reports have been submitted as appropriate.

WPDG Grant

All work plan components under the EPA 104 (b) 3 WPDGs have been completed as scheduled. Reporting requirements have been fulfilled to date. Data has been submitted to EPA for review along with quarterly reports. These projects are continuing as planned.

B. Reporting Requirements

See Section *6A*.

C. Staff Expertise

See Resumes of the Project Manager and Other Key Personnel, Section 8 – Optional Attachments.

Section 7 – Budget

A. Budget Detail

Line Item & Itemized Cost	EPA Funding
Personnel	
Project Manager @ $35.06/hr x 40 hrs/wk x 6 wks	$8,415
TOTAL PERSONNEL	$8,415
Fringe Benefits	
44% of Salary @ 44% x Total Personnel (401K, health, life insurance, workers comp, disability, unemployment, etc.)	$3,702
TOTAL FRINGE BENEFITS	$3,702
Travel	
Transport calibrator to St. Paul, MN	$316
TOTAL TRAVEL	$316
Equipment	
O3 Analyzer	$10,486
O3 Calibrator	$18,339
Zero Air System	$9,938
Datalogger	$8,500
TOTAL EQUIPMENT	$47,263
Supplies	
Modem	$700
Teflon filters ($225 per package)	$225
Miscellaneous hardware and supplies for installation	$1,000
TOTAL SUPPLIES	$1,925

Contractual	
	$0
TOTAL CONTRACTUAL	$0
Other	
RLDNR Office Admin. Pooled Direct Costs (30% of Salary)	$2,524
Electric use for monitoring equipment ($45.00 per month x 30 months)	$1,350
Shipping charges	$400
TOTAL OTHER	$4,274
TOTAL DIRECT	**$65,895**
Indirect Charges	
Federal Indirect Cost Rate x Personnel = Indirect Cost (Federal Negotiated Indirect Cost Rate = 19.07%)	$1,605
TOTAL INDIRECT	**$1,605**
TOTAL FUNDING	$67,500
TOTAL PROJCET COST	**$67,500**

B. Reasonableness of Cost

Each itemized cost is necessary for the success of this project as a whole. To complete all work plan components and tasks, it will be important that the budget is also considered as "a whole." All work plan Components and Tasks will require Personnel (salary) and its associated costs, including Fringe Benefits, Indirect Charges, and Other (Office Admin.). Additional costs related to Work Plan Components and their respective Tasks are as follows:

Work plan component/task	Itemized costs
Purchase and Install Ozone Monitor	
Task 2 Order monitor	Equipment costs (O_3 Analyzer, O_3 Calibrator, Zero Air System, Datalogger), Supplies (Modem, Teflon filters)
Task 4 Install monitor	Supplies (Misc. hardware and supplies for installation)
Ozone Monitor Operation and Maintenance	
Task 2 Wk/mo checks & maintenance	Supplies (Teflon filters)
Task 3 Calibrations	Equipment (O_3 Calibrator)

C. Expenditure of Awarded Funds

The Timeline and Budget for this project will be followed as closely as possible. All documents required for purchases (quotes, invoices, etc.) will be submitted to Purchasing through Red Lake's digital accounting system, Laserfiche. There will be financial oversight from the RL DNR Environmental Program Director (see Section *8B*) and the Tribal Accounting Office. There will also be project oversight from and quarterly meetings with the Environmental Program Director.

Section 8 – Optional Attachments

A. Partnership Letters
   - Minnesota Pollution Control Agency (MPCA), Kurt Anderson
   - Red Lake Department of Natural Resources (RL DNR), Al Pemberton

MINNESOTA POLLUTION CONTROL AGENCY

520 Lafayette Road North | St. Paul, Minnesota 55155-4194 | 651-296-6300

800-657-3864 | Use your preferred relay service | info.pca@state.mn.us | Equal Opportunity Employer

March 21, 2021

Darrell Seki, Sr.
Tribal Chairman
Red Lake Band of Chippewa Indians

SENT VIA EMAIL dseki@redlakenation.org

Dear Chairman Seki:

It is my pleasure to write this letter in support of the Red Lake Band of Chippewa Indians' grant proposal submission to the U.S. Environmental Protection Agency (EPA) to purchase, operate, and maintain an ozone monitor that will eventually be incorporated into our network and Primary Quality Assurance Organization (PQAO). We have been working with the Red Lake Department of Natural Resources since 2014 monitoring PM2.5, and are confident that this new project partnership will be equally successful.

This is an important project as it fills a data gap for ozone monitoring in the region and the state. Operating a regulatory monitor at this location will improve modeling and forecasting of ozone levels and the AQI in the region. This will allow the Tribe and the State to better communicate pollution and related risks to the citizens of Red Lake and Minnesota. Moreover, this project offers both of our organizations the chance to collaborate and maximize our reach and impact.

The Minnesota Pollution Control Agency operates ozone monitors in several locations in Minnesota and has many years of experience doing so. We are happy to be a project partner by providing support in the form of our Monitoring Unit's staff time for initial set up, technical support, audits, and calibrations, as well as data QA/QC and making data available to the public through the AirNow website. We intend for this commitment to last beyond the three-year grant timeframe.

Sincerely,

Kurt E. Anderson

Kurt Anderson
Supervisor
Air Monitoring Unit
Environmental Analysis & Outcomes Division

KA:je

RED LAKE BAND
of CHIPPEWA INDIANS
RED LAKE NATION HEADQUARTERS

PO Box 550, Red Lake, MN 56671 Phone 218-679-3341 • Fax 218-679-3378

March 16, 2022

Darrell Seki, Sr.
Tribal Chairman
Red Lake Band of Chippewa Indians
dseki@redlakenation.org

Dear Chairman Seki,

We are writing this letter of support for our air quality program to increase their monitoring capabilities by adding an ozone monitoring station on the Red Lake Reservation. This letter will accompany a proposal to the Environmental Protection Agency (EPA) to purchase, operate, and maintain this equipment. We have identified a location to house this unit and the cost of maintaining this equipment will be minimal. We will also be working with the Minnesota Pollution Control Agency, to ensure that our sampling protocol mimics theirs, so this data can be directly compared. The project period of this grant is for only 3 years, but we will continue to use and support this equipment after that time to establish a local long term monitoring station.

If you have any further questions, or would like an additional information, please contact me at the DNR.

Sincerely,

Al Pemberton
Red Lake DNR Director
P.O. Box 279
Red Lake, MN 56671
apemberton@redlakenation.org

B. Resumes of the Project Manager and Other Key Personnel

- Jennifer Malinski, Project Manager
- John LeBlanc, Environmental Program Director

Jennifer Malinski

Ex. 6 Personal Privacy (PP)

Employment

Air Quality Specialist ▪ Red Lake DNR ▪ Red Lake, MN 2010 - Present

- Acquire and manage US Environmental Protection Agency (EPA) Clean Air Act Section 105 Tribal Air Grant (grant proposals, budget management, reporting, project management) and continue to build capacity and develop the Tribal Air Program
- Operate and maintain continuous PM2.5 monitoring site in cooperation with the Minnesota Pollution Control Agency (MPCA)
- Operate and maintain Clean Air Status and Trends Network (CASTNET) and National Atmospheric Deposition Program (NADP)/AMoN air monitoring sites in cooperation with EPA
- Carry out sampling as part of NADP's Litterfall Mercury Monitoring Initiative
- Provide education and outreach to the community by participating in the Red Lake Annual Health Fair and other community events
- Provide basic indoor air quality (IAQ) home assessments upon request
- Document writing and review, including QAPPs, Emissions Inventories, home assessment report of findings, etc.

Instructional Assistant ▪ Bemidji State University ▪ Bemidji, MN 2008 - 2010

- Graded papers and quizzes for 80 environmental studies students per semester
- Facilitated undergraduate sociology group discussion, exams and classroom technology
- Evaluated student written work and maintained grade/attendance records

Instructor: course recitation ▪ The Ohio State University ▪ Columbus, OH 2006 - 2007

- Instructed two Environmental Science/Landscape Architecture classes per quarter
- Developed curriculum and methodology through collaboration with colleagues
- Acted as student-professor interface, evaluated student work

GIS Digitizing Technician ▪ USDA Farm Service Agency ▪ Bemidji, MN 2004 - 2005

- Maintained and improved Minnesota Conservation Reserve Program database records
- Managed database tables and associated maps in ArcView
- Conducted meetings with GIS specialists via teleconference and Microsoft NetMeeting

Education

Bemidji State University ▪ Bemidji, MN
M.S. Environmental Studies, Thesis ▪ 2014

The Ohio State University ▪ Columbus, OH
Graduate Coursework, 25 Credits ▪ 2007

Bemidji State University ▪ Bemidji, MN
B.S. Environmental Studies, Cum Laude ▪ 2004

Relevant Coursework

Air Pollution Technology, Field Research, Statistical Data Analysis, Environmental Management & Safety

Related Trainings

- Air Pollution Control Orientation Web Course September 8, 2010
  EPA's Air Pollution Training Institute
- EPA Grants Management Training Workshop November 2 – 3, 2010
  Leech Lake Tribal College / Environmental Protection Agency

John LeBlanc

jleblanc@redlakenation.org Ex. 6 Personal Privacy (PP) 5761 High School Dr, PO Box 279, Red Lake, MN

Summary

Professional Environmental Manager offering 10+ years experience in Environmental Programs and 20+ years in management. Outgoing, with strong communication skills and a talent for creativity utilizing federal grant funding. Dynamic learner with facility for rapidly mastering new modalities. Expert in Underground Storage Tank regulations compliance.

Experience

Environmental Program Director

Red Lake Band Of Chippewa Indians • Red Lake, MN
10/2010 - Present

- Collaboration with US EPA on Regional and National Level for successful multimedia program management, funding opportunities, and training instruction
- Development of Tribal Hazardous Substance Control Act (February 2012) with National Brownfields Conference Honors Recognition (May 2013)
- Successful utilization of federal grants for investigation and assessment of potential threats to the environment
- Development and utilization of a Tribal Response Program Manual, Hazard Ranking System, and cleanup standards specific to the needs of the Tribal Nation

Detention Officer Supervisor

Red Lake Band Of Chippewa Indians • Red Lake, MN
03/2009 - 10/2010

- Responsible for processing, administration, and safety of inmates and staff members
- Staff scheduling, training, and communications
- CERT Team Leader

Carrier, Clerk, Supervisor, Postmaster

United States Postal Service • Ponemah, Minnesota
03/1994 - 03/2009

- Mail Carrier/Acting Supervisor Winchendon, MA form March 1993-March 2005
- Mail Processing Clerk/204B Supervisor Bemidji, MN March 2005-March 2007
- Postmaster Squaw Lake, MN March 2007-Sept 2008
- Postmaster Ponemah, MN Sept 2008-March 2009

Skills

- Management
- Scheduling
- Organizational skills
- Government Relations
- Communications

Education

Business Administration

Fitchburg State College • Fitchburg, Massachusetts
05/1995

- Graduated summa cum laude—3.7+ GPA
- Completed BS Degree Requirements on time while attending Night and/or Distance Courses while working full time

Automotive Technology

Mount Wachusett Community College • Gardner, Massachusetts
05/1993

- Graduated summa cum laude—3.8+ GPA
- President's Key Award - Highest GPA amongst Full time students
- Curriculum Award 1992

Appendix A

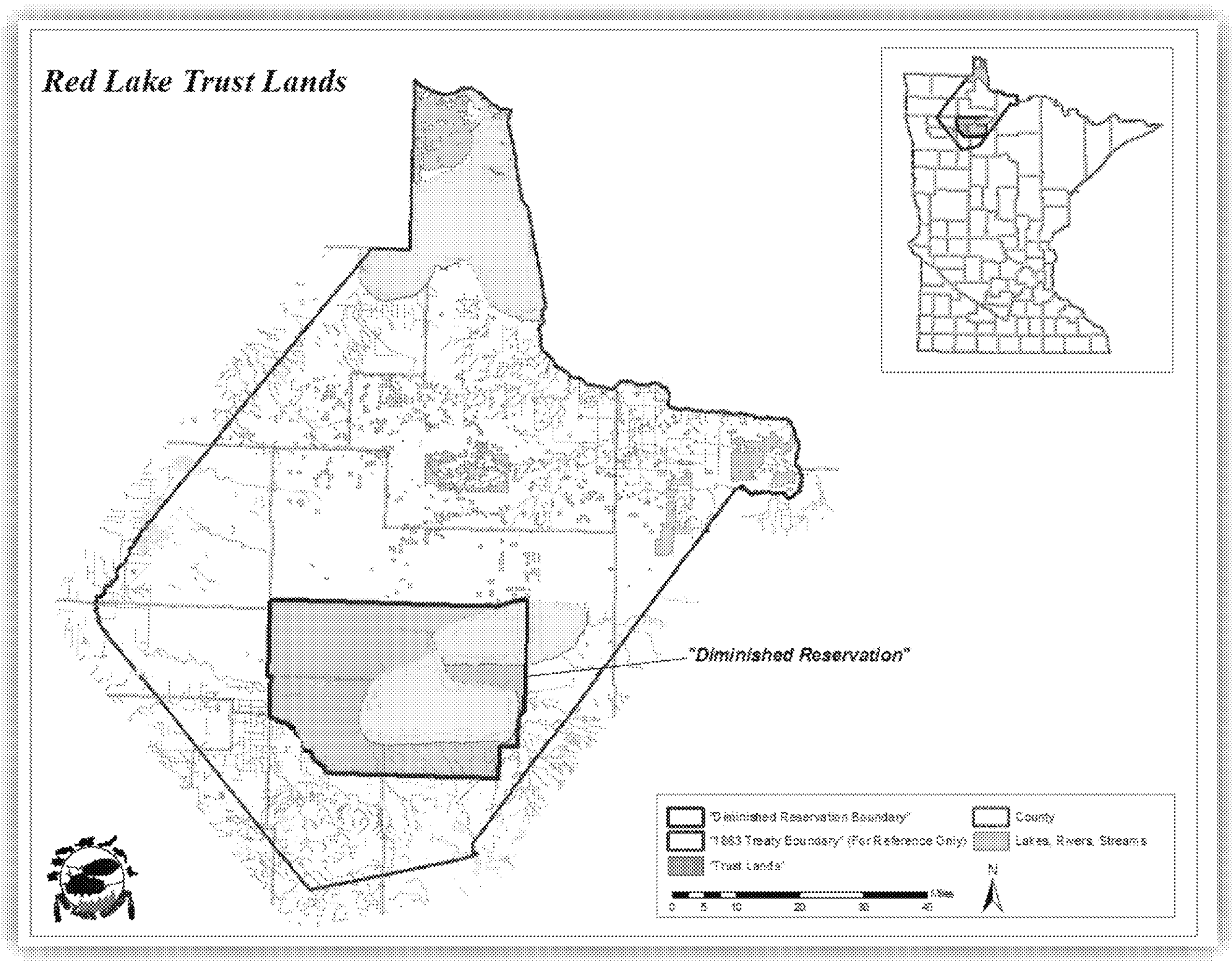


Figure 1. Red Lake Trust Lands

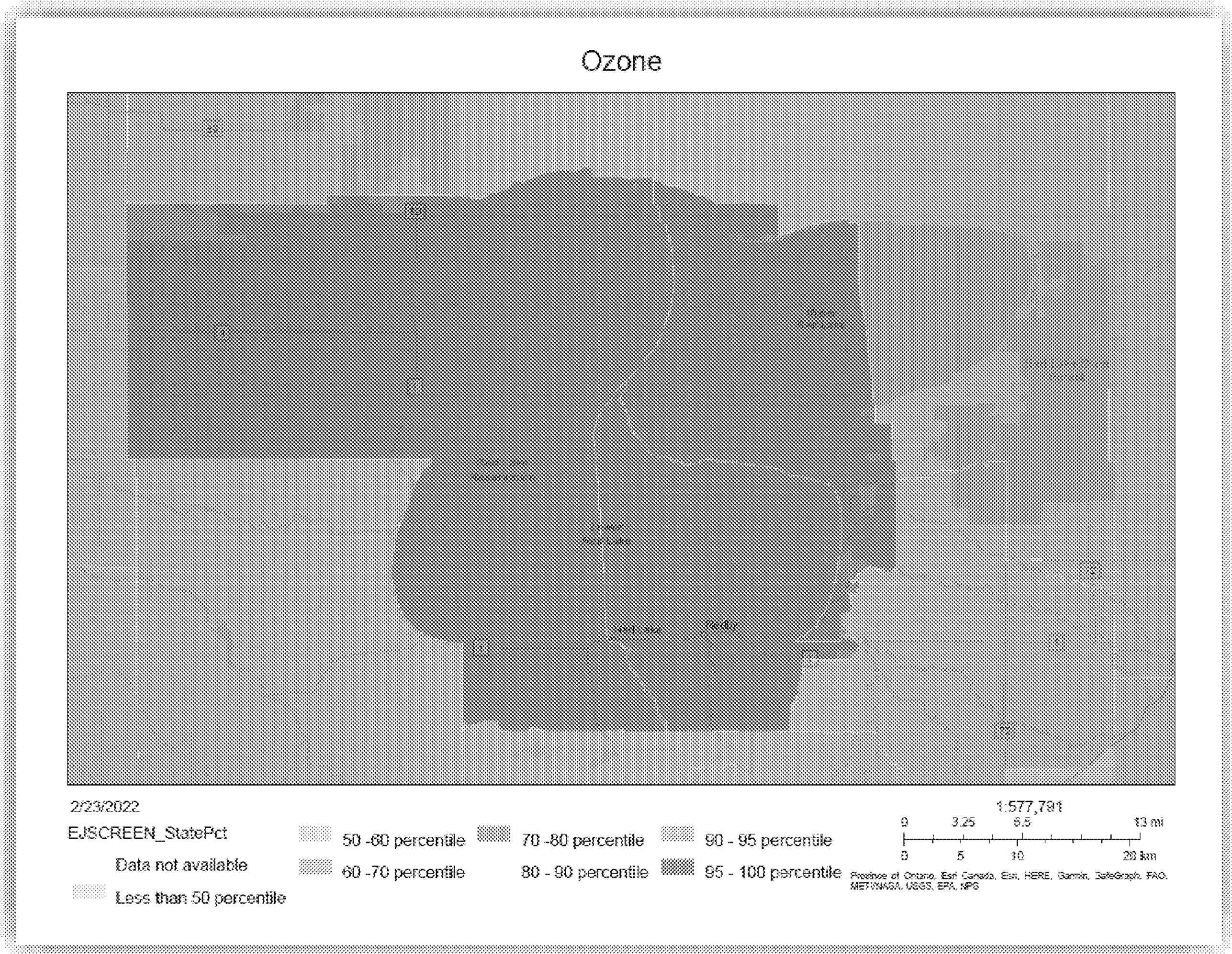


Figure 2. Red Lake's exposure/risk/proximity to Ozone

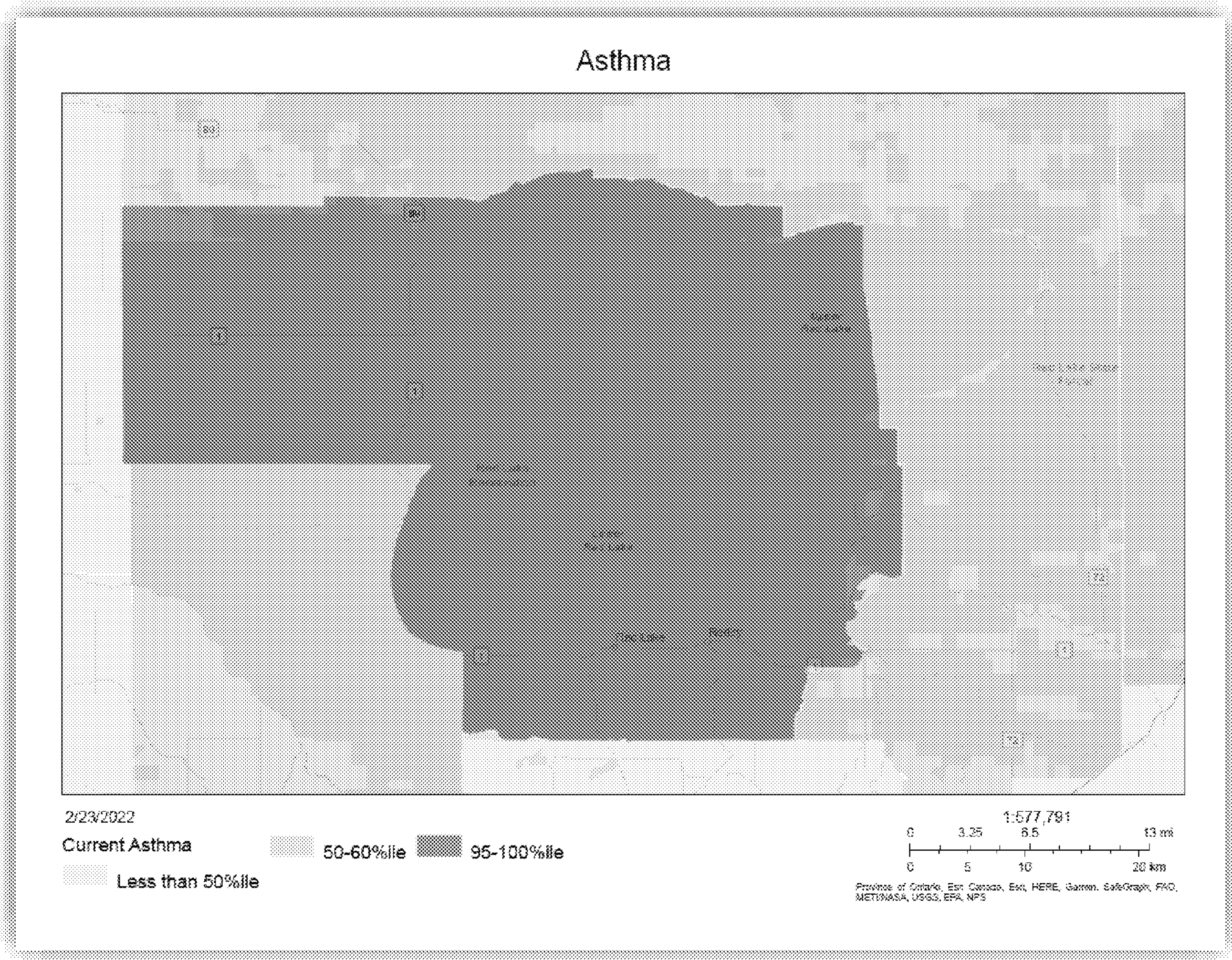


Figure 3. Red Lake Reservation - risk for asthma

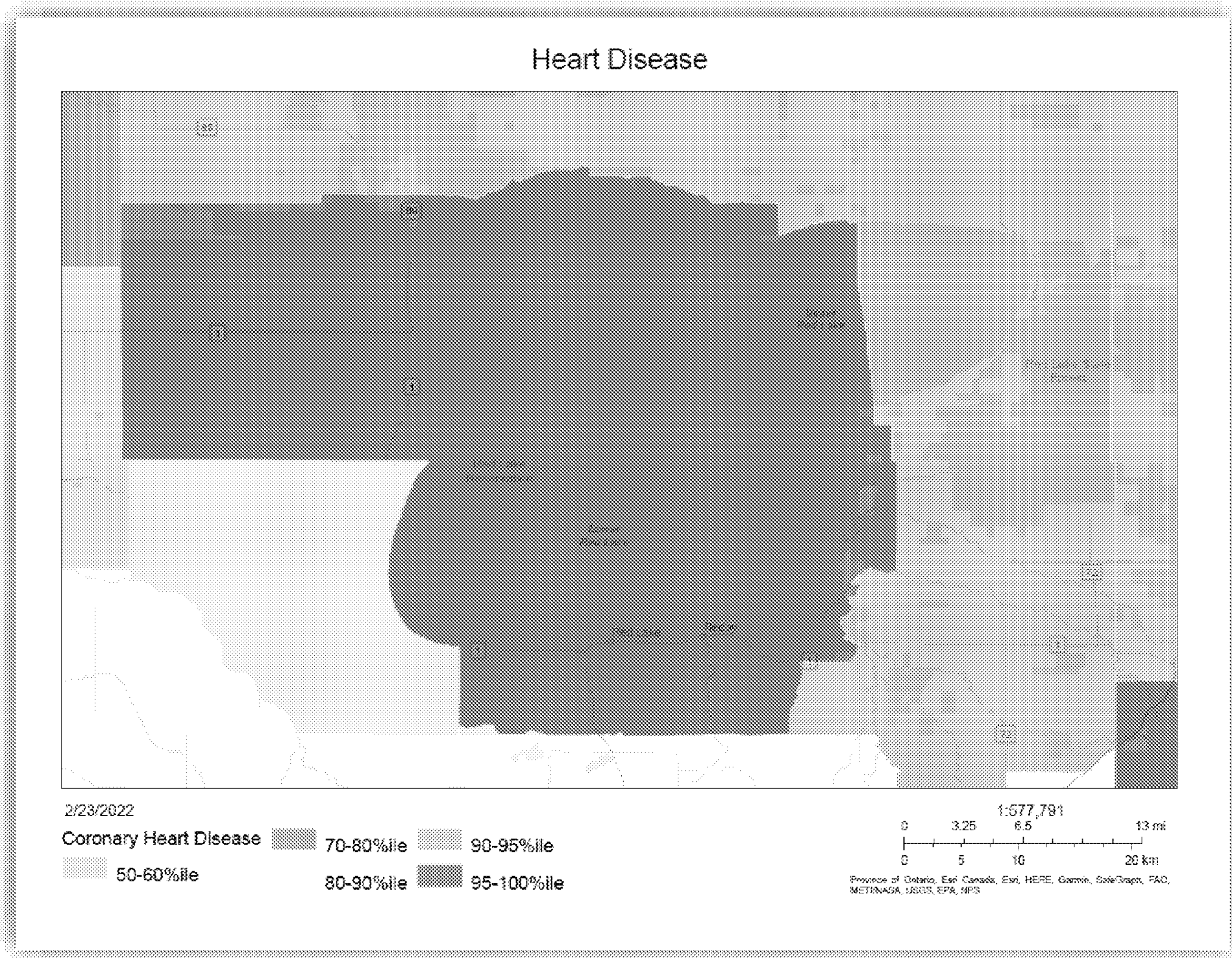


Figure 4. Red Lake Reservation - risk for heart disease

Appendix B

Quality Assurance Project Plan

Monitoring for O_3, NO_2, SO_2, CO, PM_{10}, $PM_{10-2.5}$, and Lead

September, 2017
Version 7

Minnesota Pollution Control Agency
520 Lafayette Road North, St. Paul MN 55155-4194

Table of Contents

SUPPLEMENTS

I. Quality Assurance Project Plan (QAPP) Approval

The Minnesota Pollution Control Agency (MPCA) QAPP for monitoring of criteria pollutants is hereby approved and commits the agency to follow the elements described within.

MPCA approving officials:

Signature: Todd Biewen Date: 11/29/17
Todd Biewen - Manager
Environmental Data Quality Section

Signature: [signature] Date: 11-29-17
Frank Kohlasch - Manager
Air Assessment Section

Signature: [signature] Date: 11-29-2017
Rick Strassman – Supervisor
Air Monitoring Unit

Signature: [signature] Date: 29 Nov 2017
Luke Charpentier – Supervisor
Environmental Data Quality Unit

Signature: Dennis Fenlon Date: 11/29/17
Dennis Fenlon – Quality Assurance Coordinator
Environmental Data Quality Unit

U.S. Environmental Protection Agency approving officials:

Signature: BILAL QAZZAZ Digitally signed by BILAL QAZZAZ Date: 2017.11.30 06:39:02 -06'00' Date:
Bilal Qazzaz Quality Assurance Coordinator
U.S. Environmental Protection Agency Region V

II. Distribution

A hardcopy of the approved QAPP and any subsequent version is distributed **by the Quality Assurance Coordinator to** the individuals in Table 1. The document is also accessible on the quality assurance teams' "X" drive in e-form, for viewing by anyone with MPCA network access.

Table 1: Distribution List

Minnesota Pollution Control Agency		
Name	Position	Section/Unit
Frank Kohlasch	Manager	Environmental Monitoring & Reporting
Rick Strassman	Supervisor	Air Monitoring
Kurt Anderson	Field Coordinator	Air Monitoring
Luke Charpentier	Supervisor	Environmental Data Quality
Dennis Fenlon	Quality Assurance Coordinator	Environmental Data Quality
Kellie Gavin	Information/Data Manger	Environmental Data Management
U.S. Environmental Protection Agency		
Name	Position	Office/Region
Bilal Qazzaz	Quality Assurance Coordinator	Region 5 ARD
Tribal Agencies		
Name	Position	Tribe
Joy Wiecks	Air Program Coordinator	Fond Du Lac Band of Lake Superior Chippewa
Vallen Cook	Air Quality Specialist	Grand Portage Band of Ojibwe
Charles J. Lippert	Air Quality Technician	Mille Lacs Band of Ojibwe
Jennifer Malinski	Air Quality Specialist	Red Lake Band of Chippewa

III. Acronyms, Abbreviations, and Definitions

AQS- Air Quality System: EPA's repository of ambient air quality data

BAM- Beta Attenuation Monitor

CAA- Clean Air Act

CFR- Code of Federal Regulations

CO- carbon monoxide

Criteria pollutants- the six pollutants regulated by the 1970 Clean air act (particulate matter, ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, lead)

EDO- environmental data operation; work performed to obtain, use or report information pertaining to environmental processes or conditions

EPA- Environmental Protection Agency

FEM- Federal Equivalent Method

FRM- Federal Reference Method

GC/MS- Gas Chromatography/Mass Spectrometry

LIMS-

MAAQS- Minnesota Ambient Air Quality Standards

MDL- Method detection limit

MPCA- Minnesota Pollution Control Agency

MQAG- Monitoring and Quality Assurance Group

MQO-Measurement Quality Objective

MSA-Metropolitan Statistical Area

NAAQS- National Ambient Air Quality Standard

NAMS- National Air Monitoring Stations

NO_2- nitrogen dioxide

NO_x- oxides of nitrogen

NPAP- National Performance Audit Program

O_3- ozone

Pb- lead

PEP- Performance Evaluation Program

PM- particulate matter

$PM_{2.5}$- particulate matter less than 2.5 microns in diameter (fine particulate matter)

PM_{10}- particulate matter less than 10 microns in diameter

ppb- parts per billion

ppm- parts per million

PQAO- Primary Quality Assurance Organization

PSD- prevention of significant deterioration

QAPP- Quality Assurance Project Plan

QA/QC- Quality Assurance/Quality Control

SIP- State Implementation Plan

SLAMS- State and Local Air Monitoring Stations

SO_2- sulfur dioxide

SPMS- special purpose monitoring station

SR- State rule

TSP- total suspended particulate matter

1.0 Problem Definition/Background

The Minnesota Pollution Control Agency's mission is to protect and improve the environment and enhance human health. Ambient air quality is monitored throughout Minnesota to:

1. Determine compliance with and/or progress made towards meeting the 1970 Clean Air Act (CAA) National Ambient Air Quality Standards (NAAQS)[i] and Minnesota Ambient Air Quality Standards (MAAQS), Minnesota Administrative Rules Part 7009.0080[ii].
2. Develop, modify or implement control strategies that prevent or alleviate air pollution levels over time.
3. Provide a database for research and observation of pollution trends throughout the state and region, including non-urban areas.
4. Determine whether the public is protected from pollution's harmful effects.

The NAAQS include particulate matter (PM_{10}, $PM_{2.5}$), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb); the MAAQS include all NAAQS as well as hydrogen sulfide and Total Suspended Particulates (TSP). ***All criteria pollutants except $PM_{2.5}$, which is covered under a separate QAPP, are covered in this QAPP.***

Since there is more than one objective for this data, and more than one decision maker, the quality of the data (see Section 5.0) is based on the highest priority objective, which was identified as the determination of violations of the NAAQS. This QAPP will describe how the Minnesota Pollution Control Agency's Criteria pollutant Ambient Air Quality Monitoring Program intends to control and evaluate data quality to meet the NAAQS data quality objectives.

Throughout this document, the term decision maker will be used. This term represents individuals that are the ultimate users of ambient air data and therefore may be responsible for activities such as setting and making comparisons to the NAAQS, and evaluating trends.

2.0 Project Organization

2.1 Roles and responsibilities

The U.S. Environmental Protection Agency (EPA), Tribal Authorities, and the Minnesota Pollution Control Agency are collectively responsible for meeting federal data quality requirements to compare data to the NAAQS. All participating organizations assess the quality of data and take corrective action when necessary.

2.1.1 U.S. EPA Office of Air Quality Planning and Standards (OAQPS)

OAQPS is the branch of the U.S. EPA's Office of Air and Radiation charged to protect and enhance the quality of the nation's air resources. OAQPS is responsible for oversight of the national ambient air quality monitoring network and has the following responsibilities related to the MPCA air monitoring program:

- Ensure methods and procedures used in air pollution measurements meet program objectives and produce quality data.
- Develop and implement quality assurance programs.
- Ensure guidance pertaining to quality assurance are written and revised as necessary.
- Provide technical assistance.

2.1.2 U.S. EPA Region 5 Office of Air and Radiation

U.S. EPA Region V Office of Air and Radiation is responsible for the execution of air programs in states and territories including Minnesota. Responsibilities in regards to MPCA's air monitoring program include the following:

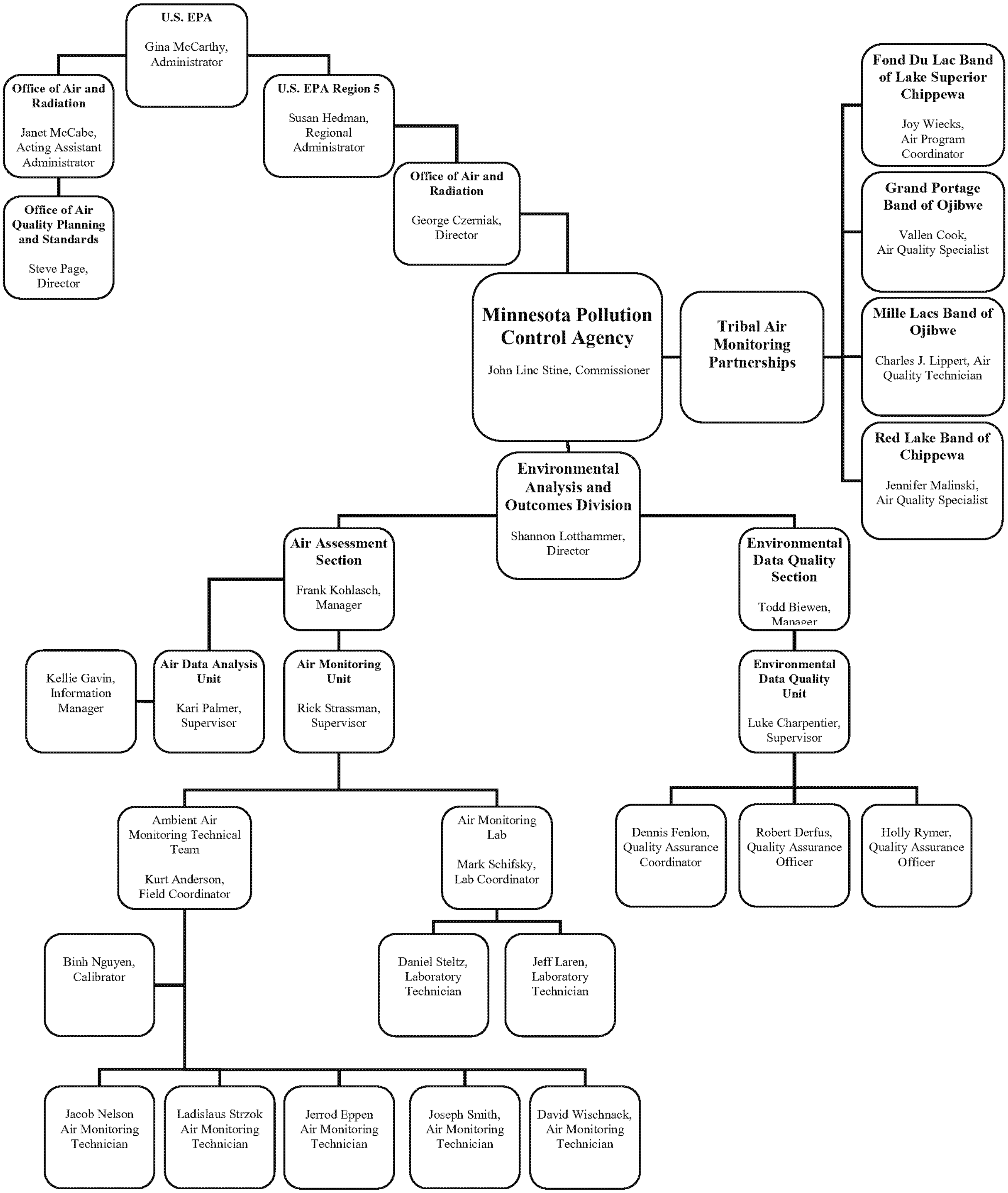
- Review and approve QAPP's.
- Evaluate program performance through technical systems audits, National Performance Audit Program (NPAP), Performance Evaluation Program (PEP), and management systems reviews.
- Act as liaison to EPA headquarters by distributing technical and quality assurance information and communicating unmet quality assurance needs.
- Reviews and approves Annual Air Monitoring Network Plan.

2.1.3 Minnesota Pollution Control Agency (MPCA)

The MPCA has the primary responsibility of developing and implementing an air monitoring QAPP as required in Minnesota's state implementation plan (SIP) as well as 40 CFR 58 Appendix A. The MPCA is also required to implement quality assurance programs in all phases of environmental data operation (EDO) including field operations, laboratory functions, and consultant or contractor laboratory services which may be acquired to gather and/or analyze data. As the environmental regulatory agency for the State of Minnesota, the MPCA must also enforce all state rules (SR) and regulations; including the MAAQS under SR 7009.0080.

Figure 2-1 charts the organizational structure of the MPCA criteria pollutant ambient air monitoring program. The specific responsibilities of each individual are crucial to a successful program. Details of each position within the MPCA criteria pollutant air monitoring program are provided in the following sections; these sections will be updated as needed.

Figure 2-1: MPCA Criteria Pollutant Air Monitoring Organizational Structure



2.1.3.1 Tribal Air Monitoring Partnerships

Minnesota Executive Order 13-10[iii] affirms the Government-to-Government relationship between the State of Minnesota and Minnesota Tribal Nations; the State recognizes the significant benefit in working together, learning about one another, and collaborating where possible. Currently, MPCA and 4 out of the 11 Tribes in the State have partnered in ambient air monitoring projects and are working toward the shared goal of gathering quality data as detailed in this QAPP. The current partner Tribes include: Fond du Lac Band of Lake Superior Chippewa (monitoring for ozone and $PM_{2.5}$), Grand Portage Band of Ojibwe (monitoring for non-FEM $PM_{2.5}$), Mille Lacs Band of Ojibwe (monitoring for ozone), and the Red Lake Band of Chippewa (monitoring for $PM_{2.5}$). Partnering with Tribal sites has many benefits such as filling in gaps in the ambient network throughout the State as well as nationally. Additionally, Tribal sites provide in-kind support for operations and land use, projects allow for collaboration on matters of mutual interest, and helps to build respectful relationships between the State and Minnesota Tribal Nations.

2.1.3.2 Environmental Analysis and Outcomes Division

The MPCA Environmental Analysis & Outcomes (EAO) Division currently conducts a variety of monitoring activities that supports the agency's overall mission of working with Minnesotans to protect, conserve, and improve our environment. To successfully address problems, agency staff needs reliable information about the status of resources, potential and actual environmental threats, options for addressing the threats, and data on how effective management actions have been. Overall, the MPCA is striving to generate data to assess, restore, and protect the integrity of Minnesota's environment. Staff in the Environmental Analysis and Outcomes Division monitor and evaluate the physical, chemical and biological conditions of Minnesota's environment. This information is used to:

- identify environmental threats and impacts to human and ecosystem health
- lead strategic planning for the agency
- help set environmental goals and measure progress in achieving them
- establish standards
- conduct risk assessments and effluent limits in support of regulatory programs
- make data accessible to agency leadership, staff, stakeholders and citizens

Director

The Environmental Analysis and Outcomes Division Director has the ultimate responsibility for QA through oversight of MPCA quality activities. The EAO Division Director gives final approval on any issues dealing with other state and federal Agencies, major issues requiring an approval, and major policy documents. The EAO Division Director is the final arbitrator for any large-scale quality assurance issues.

2.1.3.1.1 Air Assessment Section

The Air Assessment Section evaluates potential and actual air quality threats and concerns throughout the State of Minnesota.

Manager

Position currently held by: Frank Kohlasch
Responsibilities include:

- Manage budget, personnel, and logistics of section according to division policy.
- Delegate responsibilities of section to appropriate units and staff.

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- Ensure section compliance with EPA mandates and procedures.

A. Air Monitoring Unit

The Air Monitoring Unit carries out all field logistics including site set-up, quality control checks, general maintenance, equipment procurement, and operations.

Supervisor

Position currently held by: Rick Strassman
Responsibilities include:

- Direct and supervise all activities of Air Monitoring Unit
- Approves all budget and planning processes
- Assures completion of air monitoring projects within established timelines
- Establish policies that ensure quality assurance goals are appropriate and incorporated into all environmental data operations
- Directs development and implementation of all QAPP's and ensures adherence to the documents by unit staff
- Ensures that unit staff have all necessary training to perform assigned tasks
- Maintains an active line of communication with QA and technical staff

Technical Operations Field Coordinator

Position currently held by: Kurt Anderson
Responsibilities include:

- deploy a statewide criteria monitoring network
- ensure all personnel involved with the Ambient Air Monitoring Program have the necessary training and are knowledgeable in air monitoring technology
- ensure network complies with all aspects of the QAPP and tracks QA/QC status of the Ambient Air Monitoring Program
- ensuring that technical personnel follow the standard operating procedures (SOPs) included in the QAPP

Air Monitoring Technicians

MPCA Positions currently held by: Jerrod Eppen, Ladislaus Strzok, Binh Nguyen, Jacob Nelson, Joseph Smith, and David Wischnack. Tribal Air Partnership programs employ their own station operators. Station calibrations are performed by Binh Nguyen, Kurt Anderson and Ladislaus Strzok.
Responsibilities include:

- participating in the development and implementation of the QAPP
- participating in training and certification activities
- participating in the development data quality requirements (overall and field) with the appropriate QA staff
- following all manufacturer's specifications
- performing and documenting preventative maintenance
- documenting deviations from established procedures and methods
- reporting all problems and corrective actions to the field coordinator and QA Officer
- assessing and reporting data quality
- flagging suspect data

- preparing and delivering data to the Information Manager
- loading/retrieving samples
- analyzer ongoing and preventative maintenance and troubleshooting
- fill out all chain of custody forms and document all site and analyzer information in logbooks

Laboratory Operations Coordinator

Position currently held by: Mark Schifsky
Responsibilities include:

- establish laboratory capabilities to perform criteria pollutant analysis
- adhere to guidance and protocol specified by the this QAPP, the $PM_{2.5}$ QAPP, and SOPs for all lab activities
- development of data quality requirements (overall and laboratory) with the appropriate QA staff
- verifying that all required QA activities were performed and that measurement quality standards were met as required in the QAPP
- reporting all problems and corrective actions to the air monitoring supervisor, field coordinator, and QA Officer

Laboratory Technicians

Positions currently held by: Daniel Steltz & Jeff Laren
Responsibilities include:

- adhere to guidance and protocol specified by this QAPP and SOPs for the lab activities
- prepare filters and other sampling media for field deployment
- manage laboratory data
- where applicable maintain sampling equipment for data collection quality control

B. Air Data Analysis Unit

The Air Data Analysis Unit is the primary end user of collected data; data is utilized to determine pollutant design values, source impacts, and to ultimately determine the State's NAAQS attainment status.

Supervisor

Position currently held by: Kari Palmer
Responsibilities include:

- Manage budget, personnel, and logistics of section according to division policy.
- Delegate responsibilities of section to appropriate units and staff.
- Final decision maker for any contested data analysis related activity or issues that may arise.

Information Manager

Position currently held by: Kellie Gavin
Responsibilities include:

- develop local data management standard operating procedures
- develop information management activities within reasonable time frames for review and approval
- following good automated data processes
- coordinate the development of the information management system with data users
- develop data standards for data structure, entry, transfer, and archive

- adhere to the QAPP where applicable
- ensure access to data for timely reporting and interpretation processes
- development of data base guides (data base structures, user guidance documents)

2.1.3.1.2 Environmental Data Quality Section

The Environmental Data Quality Section manages all quality assurance work for MPCA programs and monitoring sites to ensure quality of data.

Manager

Position currently held by: Todd Biewen
Primary responsibilities include:

- Manage budget, personnel, and logistics of section according to division policy.
- Delegate responsibilities of section to appropriate units and staff.
- Ensure section compliance with EPA mandates and procedures.
- receives and handles all contested QA related activity or issues that may and forwards them to the EAO Director for final decisions

A. Environmental Data Quality Unit

The Environmental Data Quality Unit has the responsibility of assuring data quality. The activities carried out by the Unit are independent of the monitoring unit.

Supervisor

Position currently held by: Luke Charpentier
Responsibilities include:

- Oversees day-to-day quality assurance activities
- Ensures balance of quality assurance support for agency programs
- Meets with external agencies and parties to as needed to assist with quality assurance programmatic or policy issues

Quality Assurance Coordinator

Position currently held by: Dennis Fenlon
Primary responsibilities include:

- Develop and interpret QA policy for the Air Analysis Unit
- Ensure QAPP is in place for all environmental data operations associated with the monitoring program
- Ensure all personnel involved in environmental data operations have access to QA requirements and protocols
- Implement and oversee QA activities and corrective actions in a timely manner
- Ensure reviews, assessments, and audits are scheduled and completed
- Serve as QA liaison with EPA Region V QA Managers and QA Officers
- Review laboratory and field SOPs
- Review QAPPs for all air monitoring activities
- Audits gravimetric laboratory as well as overall air monitoring program
- Provides QA for laboratory work

Quality Assurance Officer

Position currently held by: Robert Derfus

Primary responsibilities include:

- Remain current on MPCA and EPA QA monitoring program policies
- Schedule and conduct systems audits including filter weighing audits
- Perform data quality assessments
- Write and modify standard operating procedures (SOPs)
- Verify all required QA activities are performed and that measurement quality standards are met as required in the QAPP
- Review precision and bias data
- Providing QA training to air monitoring technical staff
- Ensure timely follow-up and corrective actions resulting from audits and evaluation of activities

Quality Assurance Specialist

Position currently held by: Holley Rymer

Primary responsibilities include:

- Remain current on MPCA and EPA QA monitoring program policies
- Schedule and conduct systems audits including filter weighing audits
- Process development, review, and implementation
- Air monitoring program records management including review and update of SOPs and QAPPs
- Develop and review technical documents
- Assist Quality Assurance Coordinator and Quality Assurance Officer as needed

3.0 Project Definition/Background

3.1 Project Description

The primary goal of the Ambient Air Quality Criteria Pollutant Monitoring Program is to compare pollutant concentrations to all applicable standards as defined in the MAAQS and NAAQS. Tables 3-1 and 3-2 list the current NAAQS and MAAQS respectively.

Table 3-1: NAAQS for criteria pollutants as of October 2011

Pollutant (final rule cite)	**Primary/Secondary Standards**	**Level**	**Averaging Time**	**Form**
Carbon Monoxide (CO) (76 FR 54294, Aug 31, 2011)	Primary	9 ppm (10 mg/m^3)	8-hour	Not to be exceeded more than once per year
		35 ppm (40µg/m^3)	1-hour	
Lead (Pb) (73 FR 66964, Nov 12, 2008)	Primary and secondary	0.15 µg/m^3 (1)	Rolling quarterly average	Not to be exceeded
Nitrogen Dioxide (NO_2) (75 Fr 6474, Feb 9 2010; 61 FR 52852, Oct 8, 1996)	Primary and secondary	0.053 ppm (2)	Annual	Annual mean
	Primary	0.100 ppm	1 hour	98th percentile of 1-hour daily maximum concentrations averaged over 3 years
Particulate (PM_{10}) (40 CFR 50.6)	Primary and secondary	150 µg/m^3	24 – hour	Not to be exceeded more than once per year over 3 years
Ozone (O_3) (40 CFR 50.15; 73 FR 16511, Oct. 26, 2015)	Primary and secondary	0.070 ppm (3) 0.120 ppm	8 – hour 1-hour primary	Maximum average of the annual fourth-highest daily maximum 8-hour average Number of days per calendar year with maximum hourly average concentrations must be <1
Sulfur Oxides (SO_2) (40 CFR 50.4; 40 CFR 50.5)	Primary Secondary	0.075 ppm (4) 0.5 ppm	1-hour 3-hour	Not to be exceeded more than once per year

(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
(2) The official level of the annual NO2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
(3) The 1-hour standards set forth in this section will remain applicable to all areas notwithstanding the promulgation of 8-hour ozone standards under §50.10. The 1-hour NAAQS set forth in paragraph (a) of this section will no longer apply to an area one year after the effective date of the designation of that area for the 8-hour ozone NAAQS pursuant to section 107 of the Clean Air Act. Area designations and classifications with respect to the 1-hour standards are codified in 40 CFR part 81. (4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard,

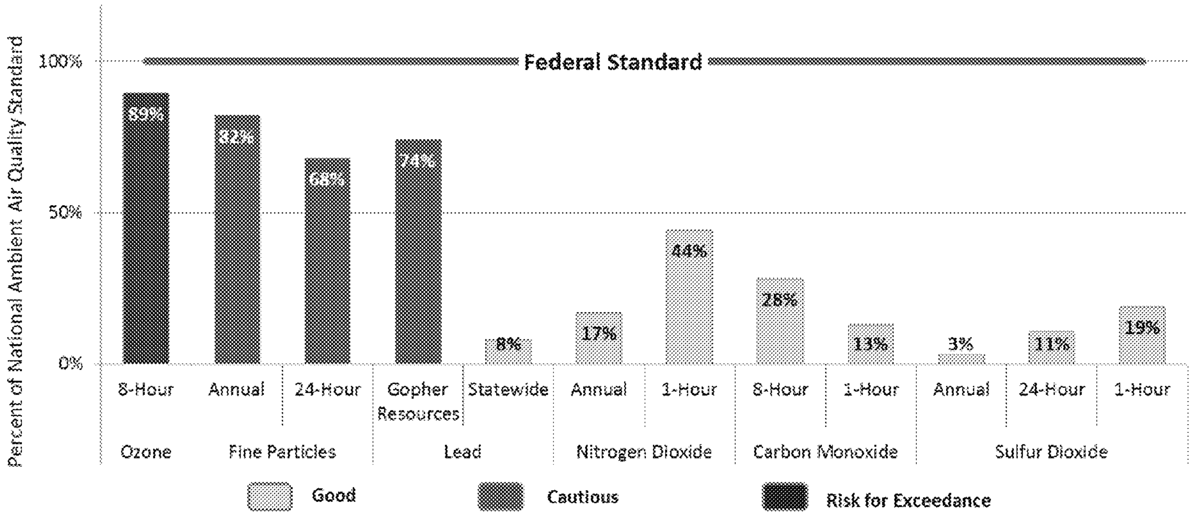
except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Table 3-2: Summary of MAAQS Standards as of April 18, 2000

Pollutant	Primary Standards	Secondary Standards	Averaging Time	Form
Hydrogen Sulfide (H_2S)	0.05 ppm (70 $\mu g/m^3$) 0.03 ppm (42 $\mu g/m^3$)	None	½ hour average ½ hour average	not to be exceeded over 2/yr not to be exceeded over 2 times in any 5 consecutive days
Carbon Monoxide (CO)	9 ppm (10 mg/m^3) 30 ppm (35 mg/m^3)	Same as primary	8-hour 1- hour	not to be exceeded more than once per year not to be exceeded more than once per year
Lead (Pb)	1.5 μg/m3	Same as primary	Quarterly average	Quarterly average
Nitrogen Dioxide (NO_2)	0.053 ppm (100 ug/m3)	Same as primary	Annual	arithmetic mean
Particulate PM_{10}	50 μg/m3 150 μg/m3	Same as primary	Annual 24-hour[g]	arithmetic mean
Ozone (O_3)	0.070 ppm	Same as primary	8 – hour	annual 4th highest maximum 8-hour average concentration is less than or equal to the standard
Particulate TSP	75 μg/m3 260 μg/m3	60 ug/m3 150 ug/m3	Annual 24 – hour[a]	geometric mean
Sulfur dioxide (SO_2)	0.030 ppm (80 $\mu g/m^3$) 0.140 ppm (365 $\mu g/m^3$) 0.5 ppm (1300 $\mu g/m^3$)	0.02ppm (60 $\mu g/m^3$) Same as primary 0.35 ppm (915 $\mu g/m^3$) 0.5 ppm (1300 $\mu g/m^3$)	Annual 24-hour concentration 3-hour concentration 3- hour concentration 1-hour and 3-hour concentration	arithmetic mean not to exceed 1/yr not to exceed 1/yr not to exceed 1/yr not to exceed 1/yr

Agency decisions are supported by environmental data that are scientifically and legally defensible. Data from this program are used for regulatory purposes and failing to meet air quality standards can have serious implications. Accordingly, it is important to have an effective QA/QC program to ensure credible and accurate data. Figure 3-1 illustrates current trends toward meeting the Federal Standards based on criteria pollutant monitoring data.

Figure 3-1: Statewide maximum criteria pollutant design values shown as percent of NAAQS



Source: Minnesota NAAQS Design Values, 2013

Monitoring locations including pictures, site details, and parameters monitored for can be found in the Annual Air Monitoring Network Plan for Minnesota[iv]. The annual network plan, just like this QAPP, is a living document and is updated yearly and on an as-needed basis.

3.1 Field activities

The following is a general description of the field activities. The MPCA air monitoring network consists of 53 field stations which includes both long-term and short-term monitoring stations. If a given site is determined to no longer be useful for trends (or other) purposes, then it may be discontinued or relocated. The MPCA Air Monitoring Unit staff members conduct field operations at each site. The MPCA also contracts local operators to perform all necessary field operations at a few remote sites.

Field operator activities include both installing and removing filters of particulate samplers, performing leak and flow rate checks with NIST certified standards, and data collection either hardcopy or through the use of portable digital devices. Field operator activities may also include the quality control procedures of zero, precision and span, both manual and automated, for continuous monitors and all routine maintenance duties.

The field activities of the calibration specialist include the site calibration of all continuous monitors and certifying site calibration devices with NIST certified standards. Quality assurance auditors perform both system and performance audits at the sampling sites using NIST certified standards.

3.2 Laboratory activities

Laboratory activities related to criteria pollutants are limited to gravimetric analysis of particulate filters, including sample preparation and equilibrium and sample storage. Other laboratory activities supporting the criteria network include the certification of calibration transfer standards, certification/re-certification of gas standards, flow, temperature and pressure devices and other routine instrument maintenance. From time to time, particulate sample filters may require optical microscopy to aid in the determination of particle identification or composition; this is also performed in the air laboratory.

3.3 Schedule of activities

There are a variety of activities which follow specific schedules and others that are implemented as best practices. The following sections detail the most critical program schedules as they relate to the goals of acquiring quality data.

3.3.1 Operating schedule

Ambient air quality data collected by the MPCA shall be collected as follows:

For continuous analyzers--consecutive hourly averages except during:
(1) Periods of routine maintenance,
(2) Periods of instrument calibration, or quality assurance audits
(3) Periods or seasons exempted by the EPA Regional Administrator.
(4) Hydrogen sulfide monitors shall collect half hour averages.

Ozone will be monitored from March 1st to October 31st of each calendar year, unless maintained for AQI proposes.

For manual particulate methods (PM_{10} samplers, TSP samplers) at least one 24-hour sample must be obtained according to EPA's Monitoring Schedule[v] every sixth day except during periods or seasons exempted by the EPA Regional Administrator.

3.3.2 Quality control

A one-point precision check must be performed at least once every 2 weeks on each automated analyzer used to measure SO_2, NO_2, O_3 and CO. The precision check is made by challenging the analyzer with a precision check gas of known concentration between 0.01 and 0.10 ppm for SO_2 NO_2, and O_3 analyzers, and between 1 and 10 ppm for CO analyzers. If a precision check is made in conjunction with a zero or span adjustment, it must be made prior to such zero or span adjustments. Randomization of the precision check with respect to time of day, day of week, and routine service and adjustments is encouraged where possible. Flow is verified for continuous particulate (PM_{10}) monitors on a monthly basis.

3.3.3 Audit frequency

Each calendar quarter (during which analyzers are operated), the Quality Assurance Team will conduct a performance audit on at least 25 percent of the MPCA analyzers that monitor for SO_2, NO_2, O_3, or CO such that each analyzer is audited at least once per year. All particulate samplers (PM_{10} & TSP) shall be audited twice per year, 5-7 months apart. Additionally, audits for any parameter may be conducted throughout the year on an as needed basis.

3.3.4 Network corrective actions

All problems regarding field sampling must be reported to the Technical Operations Field Coordinator (TOFC). Including but not limited to instrument malfunctions, site access issues, site safety or acts of vandalism. Any Laboratory concerns including sample preparation, lab safety, or lost/missing samples must be directed to the Laboratory Operations Coordinator (LOC). Verbal communication followed by an e-mail to the proper staff member is the preferred method of communication.

3.3.5 Annual network review

The MPCA annually assesses the ambient air quality monitoring network to eliminate unnecessary stations or to correct any inadequacies indicated by the result of the annual review required by 40 CFR 58.20(d)[vi]. The MPCA consults with the EPA Region 5 Regional Administrator prior to any monitoring program modification. The final schedule and modifications will be subject to the approval of the Region 5 Administrator. Nothing in this QAPP will preclude the MPCA, with the approval of the Region 5 Administrator, from making modifications to the SLAMS network for reasons other than those resulting from the annual review.

4.0 Quality Objectives and Criteria for Measurement Data

The MPCA maintains and evaluates interrelated functions to achieve assessable quality of data. One function is the control of the measurement process through broad quality assurance activities, such as establishing policies and procedures, developing SOPs, assigning roles and responsibilities of staff conducting oversight and reviews, and implementing corrective actions. Other functions include control of the measurement process through the implementation of specific quality control procedures, such as audits, calibrations, co-located sampling and other routine self-assessments. The results of quality assurance reviews and assessments indicate whether the control efforts are adequate or need to be improved. Quality control checks and specifications for methods are included in the respective reference methods described in 40 CFR Part 50 or in the respective equivalent method descriptions available from EPA.

4.1 Data Quality Objectives

Generally, data quality objectives (DQOs) and acceptability criteria define factors critical for producing data of a known and acceptable quality. The DQO process is a strategic planning approach used to prepare for a data collection activity in order to support decision-making. The DQO process helps to ensure the type, quantity, and quality of environmental monitoring data is sufficient for the data's intended use, while simultaneously ensuring that resources are not wasted collecting unnecessary or redundant data. The formal DQO process consists of seven steps that allow an experimental design to be developed to meet specific decision criteria specified by stakeholders in the decision, as described in EPA QA/G-4, *Guidance on Systematic Planning Using the Data Quality Objectives Process*[vii], and in Section 3 of the *Quality Assurance Handbook for Air Pollution Measurement System*[viii]*s*. The seven steps are:

- State the Problem
- Identify the Decision
- Identify the Inputs to the Decision
- Define the Study Boundaries
- Develop a Decision Rule
- Specify Tolerable Limits on the Decision Errors
- Optimize the Design for Obtaining Data

1. State the Problem

U.S. EPA defined NAAQS levels that ensure adequate protection of human health and the environment. The State of Minnesota attainment status of the gaseous NAAQS is determined by comparing monitoring results for the most recent three year period for O_3, NO_2, SO_2 and for the most recent one year period for CO with the applicable NAAQS, as specified in 40 CFR Part 50. U.S. EPA uses a formal process to designate attainment, nonattainment, or unclassifiable status for the criteria pollutants, which includes reviewing monitoring data and recommendations made by MPCA. The attainment determination may impact activities related to the regulation of the particular pollutant. Criteria pollutant data are also used for trend analyses, to assess the effects of national, state, and local emission control programs and to track progress toward attaining the Minnesota Ambient Air Quality Standards (MAAQS) as required by Section 7009.0080 of the MPCA Administrative Rules[ix].

2. Identify the Decision

The primary decision for criteria pollutant monitoring is for determining the attainment status of the NAAQS (Table 3-1). Other decisions include declaring air pollution health advisory alerts, warnings or emergencies, establishing pollutant background concentrations for compliance modeling, and implementing air pollution abatement actions. Monitoring is also performed to provide data of sufficient quantity and quality to determine the attainment status for the criteria pollutants for which areas of Minnesota are not in attainment, lead, and for which there are known maintenance areas due to previous nonattainment for lead, CO, SO_2, and PM_{10}.

The official boundaries of Minnesota's current maintenance areas are as follows:

Carbon Monoxide:

- The area within the official city limits of the city of St. Cloud contained within Benton, Sherburne, and Stearns Counties
- City of Duluth
- Anoka, Hennepin, Ramsey, and portions of Carver, Dakota, Scott, Washington, and Wright Counties

Sulfur Dioxide:

- Seven county Twin Cities Metropolitan Area (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, Washington)
- City of Rochester

Particulate Matter (PM_{10}):

- A portion of the city of Rochester, bounded on the south by U.S. Highway 14; on the west by U.S. Highway 52; on the north by 14th Street N.W. between U.S. Highway 52 and U.S. Route 63 (Broadway Avenue), U.S. Route 63 north to Northern Heights Drive, N.E. and Northern Heights Drive N.E. extended east to the 1990 city of Rochester limits; and on the east by the 1990 city of Rochester limits.
- A portion of the city of St. Paul bounded by the Mississippi River from Lafayette to Route 494, Route 494 east to Route 61, Route 61 north to I-94, I-94 west to Lafayette, and Lafayette south to the Mississippi River.

The official boundaries of Minnesota's current nonattainment areas are as follows:

Lead

- A portion of the city of Eagan bounded by Lone Oak Road (County Road 26) to the north, County Road 63 to the east, Westcott Road to the south, and Lexington Avenue (County Road 43) to the west

3. Identify the Inputs to the Decision

Inputs required for the decision specific to the NAAQS include:

- Annual Monitoring Network Plan that demonstrates the monitoring network meets the requirements of 40 CFR Part 58
- Three years of one-hour average of continuous gaseous pollutant (O_3, NO_2, CO, SO_2) monitoring data
- Three year average of the 4th highest 8-hour average O_3 value for each O_3 monitoring site
- Annual average NO_2 values for each NO_2 monitoring site
- Annual 2nd highest 1-hour and 2nd highest 8-hour CO levels for each monitoring site
- Annual 2nd highest 24-hour average and annual average SO_2 values for each SO_2 monitoring site

- Three years of annual average PM_{10} values for each PM_{10} monitoring site.
- Rolling three month average Pb values.

Non-NAAQS related inputs that affect the design and function of the network include:

- Pollutant model requirements and objectives
- Pollutant distribution changes
- Pollution history and trends
- Meteorology
- Topography
- Budget and Staffing
- State Implementation Plan Requirements
- MPCA Rules (7011.0150, 7007.1148)
- Minnesota Statues (88.171)
- Community Feedback

4. Define the Study Boundaries

The study boundary is defined as the area under the jurisdiction of the State of Minnesota. The Minnesota jurisdictional boundary encompasses all Metropolitan Statistical Areas (MSA's) within the State of Minnesota as defined by the U.S. Office of Management and Budget and the U.S. Census Bureau. The two largest MSA's in the state include the Minneapolis-St. Paul-Bloomington MSA (33460) and Duluth MSA (20260). The 2013 population estimate for the Minneapolis-St. Paul-Bloomington MSA is 3,459,146 people and 279,887 people for the Duluth MSA.

5. Develop a Decision Rule

NAAQS Related Decisions

Non-attainment is determined if the design value for a specific pollutant and averaging time exceeds the acceptable standard level established by the NAAQS (Table 3-1). EPA performs NAAQS designations on a regular schedule, if monitoring results violate the NAAQS during the designation schedule the State may be designated as non-attainment. If Minnesota is designated as non-attainment for one of the NAAQS, then it is required to prepare and submit a course of action in a Non-Attainment Plan (NAP) or Air Quality Management Plan (AQMP) submitted to the U.S. EPA that demonstrates how the State will attain the specified NAAQS by the required attainment date.

Attainment status is determined if the specific pollutant is under the acceptable level in the NAAQS. If Minnesota is designated as attainment for one of the NAAQS, then it is required to prepare and submit a maintenance plan or specify in the AQMP submitted to the U.S. EPA that demonstrates how attainment will be maintained with the specified NAAQS.

A minimum of 75% completeness value per calendar quarter is an indicator if there is sufficient data for NAAQS determination. If there is not sufficient data to determine attainment status for a specified NAAQS, then the U.S. EPA will designate unclassifiable for the specified NAAQS and would require more data. This will trigger an action for determining the cause of the low completion and addressing any findings to improve completion percentages.

Non-NAAQS Related Decisions
Non NAAQS related actionable results may include:

- Alerting the public when levels of pollutants impact regional air quality
  - Advisories (based on imminent or occurring conditions)
  - Air Alerts: Public air pollution alerts based upon measured real-time AQI thresholds over 100 (Unhealthy for Sensitive Groups or above)
  - Air Quality Forecasts (forecasts rely on current and historical air monitoring data)
    - Criteria pollutant concentration and AQI forecasts
- Public outreach mechanisms (forecasts, advisories, and current air quality conditions)
  - MPCA web maps and data
  - U.S. EPA AirNow web maps and data
  - Cellular phone applications
  - Email and social media forecasts and alerts (AirAlerts/EnviroFlash, twitter, etc.)
  - Media outreach
- Identifying potential sources of pollutants
  - Source apportionment
  - Emissions inventory reconciliation

6. Specify Tolerable Limits on the Decision Errors

For NAAQS purposes and MPCA planning projects that use annual data (i.e. modeling, trends analysis, etc.), the acceptable limits for measurement uncertainty are outlined in Table 4-1:

Table 4-1: Acceptable limits for measurement uncertainty (using 1-point QC checks)

Pollutant	Confidence limit	Precision/Bias
O3	upper 90%	CV 7.1 % for precision
	upper 95%	absolute bias of 7.1 % for accuracy
CO, SO2,	upper 90%	CV 10.1% for precision
	upper 95%	absolute bias of 10.1 % for accuracy
NO2	upper 90%	CV 15.1% for precision
	upper 95%	absolute bias of 15.1 % for accuracy

Uncertainty is used as a generic term to describe the sum of all sources of error associated with an EDO and can be illustrated as follows:

$$S_o^2 = S_p^2 + S_m^2$$

where:
S_o= overall uncertainty
S_p= population uncertainty (spatial and temporal)
S_m= measurement uncertainty (data collection).

For non-NAAQS objectives that are on shorter timescales for reporting such as forecasting and alerts, the tolerances are based upon balancing data reporting time frames and control checks that are capable of being done in that time frame. Therefore, the uncertainty is defined by a subset of quality control checks presented in Section 6.0 that can be conducted in real time. There are many automatic quality control checks as well as threshold concentrations that alert staff to check the instrumentation to ensure proper operation. These thresholds are based on station location and parameter. Additional measures include comparing to historical air data for season and location and if data look unusual from historical comparisons and current expectations.

7. Optimize the Design for Obtaining Data

The primary design objective of the criteria pollutant monitoring network is to meet the requirements of 40 CFR Part 58 Appendix C, including areas of high population, highest concentrations, downwind of major point sources, and near transport corridors. Design also considers impending decisions which may be based upon the data with higher priority measurements receiving quality control that exceeds the CFR requirements such as design value sites on pollutants that have an ambient concentration near the NAAQS. MPCA optimizes quality control and quality assurance criteria as outlined in the *Quality Assurance Handbook Volume II, Appendix D* and is detailed more in Sections 6.0 and 10.0.

MPCA establishes local DQOs based upon the federal data quality requirements if the objective is intended to be comparable to the NAAQS. This may mean that objectives, including those with less stringent requirements, may still meet the requirements for the NAAQS where applicable. This ensures that decision makers could make comparisons to the NAAQS within the required certainty of the measurements if intended. Design considerations such as pollutant attainment status, projected pollutant attainment designation, proximity of the ambient concentrations to the NAAQS, instrument reliability, and special study objectives may affect the level of data quality practices above the requirements for criteria pollutant measurements. Other air monitoring objectives not related to the criteria pollutants require different DQOs and are beyond the scope of this document. However, other QAPPs may address these, especially if related to other federal programs such as PM2.5 Speciation and NCORE. If the objectives do not match any of the federal programs, then it may be addressed in a Special Monitoring Projects QAPP.

4.2 Data Quality Indicators

Data quality indicators (DQIs) describe the general framework for ensuring that network data are of known and documented quality and available in a timely manner to meet the DQOs. These indicators include precision, accuracy, bias, completeness, representativeness, comparability, and other related criteria. Section 6.0 provides detailed descriptions for criteria pollutant DQIs. Data quality indicators are calculated in the AQS reports AMP256, AMP430 and AMP450 reviewed quarterly as part of the validation process and annually for the QA certification process.

All ambient monitoring methods or analyzers used by the MPCA are tested periodically, as described in the 40 CFR 58 Appendix A[x], to quantitatively assess data quality. Measurement uncertainty is estimated for both automated and manual methods; calculated on the basis of single monitors. Terminologies associated with measurement uncertainty include:

<u>Precision-</u> A measurement of mutual agreement among individual measurements of the same property usually under prescribed similar conditions, expressed generally in terms of the standard deviation;

1. For each PM measurement pair, calculate the coefficient of variation cv_i

$$cv_i = \frac{|d_i|}{\sqrt{2}}$$

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2. Summarize the coefficient of variation to the quarterly level, $CV_{j,q}$ according to

$$CV_{j,q} = \sqrt{\frac{\sum_{i=1}^{n_j} CV_i^2}{n_{j,q}}}$$

Where $n_{j,q}$ is the number of collocated pairs in quarter q for site j.

3. The precision estimate is used to assess the one-point QC checks for SO_2, NO_2, O_3, or CO

$$CV = \sqrt{\frac{n \cdot \sum_{i=1}^{n} d_i^2 - \left(\sum_{i=1}^{n} d_i\right)^2}{n(n-1)}} \cdot \sqrt{\frac{n-1}{\chi^2_{0.1,n-1}}}$$

where n is the number of single point checks being aggregated; $X^2_{0.1,n-1}$ is the 10th percentile of a chi-squared distribution with n-1 degrees of freedom.

Representativeness- the degree in which data accurately and precisely represents a characteristic of a population, parameter variation at a sampling point, a process condition, or an environmental condition;
Accuracy- The degree of agreement between an observed value and an accepted reference value, accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations;
Bias- The systematic or persistent distortion of a measurement process which causes errors in one direction. The individual results of these tests for each method or analyzer shall be reported to EPA. The EPA will then calculate quarterly assessments of measurement uncertainty applicable to the instrument specific data as described in Section 5 of 40 CFR 58.

1. For each measurement pair, estimate the percent relative bias, d_i

$$d_i = \frac{Y_i - X_i}{(Y_i + X_i)/2} \times 100\,\%$$

Where X_i represents the concentration recorded by the primary sampler and Y_i represents the concentration recorded by the collocated sampler.

2. Summarize the percent relative bias to the quarterly level, $D_{j,q}$

$$D_{j,q} = \frac{1}{n_{j,q}} \sum_{i=1}^{n_{j,q}} d_i$$

Where $n_{j,q}$ is the number of collocated pairs in quarter q for site j.

3. Summarize the quarterly bias estimates to the three-year level using

$$\hat{D}_j = \frac{\sum_{q=1}^{n_q} w_q D_{j,q}}{\sum_{q=1}^{n_q} w_q}$$

Where n_q is the number of quarters with actual collocated data and w_q is the weight for quarter q.

4. Examine $D_{j,q}$ to determine whether one sampler is consistently measuring above or below the other.
5. Statistics for the Assessment of QC Checks for SO_2, NO_2, O_3 and CO (see *CFR 40, Part 58 Appendix A, section 4.1*).

Completeness- The measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions. Data completeness requirements are included in the reference methods (40 CFR Part 50).
Detectability- the determination of the low range critical value of a characteristic that a method specific procedure can reliably discern;
Comparability- a measure of confidence with which one data set can be compared to another.

Bias Estimate. The bias estimate is calculated using the one-point QC checks for SO2, NO2, O3, or CO. The bias estimator is an upper bound on the mean absolute value of the percent differences.

$$|bias| = AB + t_{0.95,n-1} \cdot \frac{AS}{\sqrt{n}}$$

4.2.1 Rounding Conventions

For comparing calculated concentration averages to National Ambient Air Quality Standards (NAAQS) levels, it is necessary to use round-off rules defined in Sections 4.3 of 40 CFR Part 50, Appendix N. Decimals 0.5 and greater are rounded up to the nearest whole number, and any decimal lower than 0.5 is rounded down to the nearest whole number. For SO2, NO2, O3 and CO see Table 4.2

4.3 Measurement Performance Criteria

Measurement performance criteria are used to assure data quality. Measurement Quality Objectives (MQOs) are designed to evaluate and control various phases (sampling, preparation, analysis) of the measurement process to ensure measurement uncertainty is within acceptable ranges. The MPCA follows the table for CFR related quality control samples as detailed in Section 10 of the QA Handbook Volume II, Table 10.4 as well those detailed in Appendix D of the QA Handbook Vol. II; these measurements are also applied to the state standards (e.g. TSP). Table 4-1 provides the MPCA MQO's.

MPCA conducts activity to verify the criteria are satisfied and performs corrective action(s) as soon as possible if the acceptance criteria are not met. If activities are conducted at the QC level that are outside the criteria for field operations, orders are issued from the monitoring group to the air field coordinator to the information managers for telemetry or software issues. Work orders and other documented activity are reviewed by the environmental data quality team who perform data flagging and/or invalidation as appropriate. If activities are conducted at the QA level, actions are documented and followed to completion through the corrective action process as described in Section 16.0 of this QAPP.

Table 4-2: MPCA Measurement Performance Criteria

Method	CFR Reference	Coverage (annual)	Minimum frequency	MQOs
		Automated Methods		
Rounding convention for design value calculation	1, 2 and 3) 40 CFR Part 50 App U Sec. 3(a)	Each analyzer	Over all 4 quarters	O3: 3 places after decimal with digits to right truncated CO: 1 decimal place SO2 & NO2: 1 place after decimal with digits to right truncated
One Point QC: SO_2, NO_2, O_3, CO	Section 3.2.1	Each analyzer	Once per 2 weeks	O_3 Precision 7.1%, Bias ±7.1%. NO_2 Precision 15.1%, Bias ±15.1% SO_2, CO Precision 10.1%, Bias ±10.1%
Annual performance evaluation SO_2, NO_2, O_3, CO	Section 3.2.2	Each analyzer	Once per year	See QA Handbook Vol. II Appendix D
Flow rate verification PM_{10}, $PM_{10-2.5}$	Section 3.2.3	Each sampler	Once every month	≤ 4.1% of standard and 5% of design value
Leak test PM_{10}, $PM_{10-2.5}$		Each sampler	Once per month	See QA Handbook Vol. II Appendix D
Flow rate audit PM_{10}, $PM_{10-2.5}$	Section 3.2.4	Each sampler	Once every 5-7 months	≤ 4.1% of standard and 5% of design value
Temperature check PM_{10}, $PM_{10-2.5}$		Each sampler	Once per month	±2.1°C
Barometer check PM_{10}, $PM_{10-2.5}$		Each sampler	Once per month	< ± 10.1 mm Hg
Collocated sampling $PM_{10-2.5}$	Section 3.2.5	15% within PQAO	Every 12 days	$PM_{10-2.5}$: 15.1% precision
Performance evaluation program $PM_{10-2.5}$	Section 3.2.7	1) 5 valid audits for primary QA orgs with ≤5 sites; 2) 8 valid audits for primary QA orgs with >5 sites; 3) all samplers in 6 years	Over all 4 quarters	$PM_{10-2.5}$: ±15.1% bias
Sampling time PM_{10}, $PM_{10-2.5}$	40 CFR Part 58 Appendix A; 40 CFR Part 50 Appendix J; 40 CFR Part 50 Appendix N	Each sampler	1440 minutes ±60 minutes midnight to midnight local standard time	24 hour average concentrations shall be considered valid if at least 75% of the 24-hour period are available (18 hourly values). Samples less than 18 hours shall be considered valid if, after substituting 0 for all missing hour concentrations, the resulting 24-hour daily value is greater than the

				level of the 24-hour PM_{10} NAAQS.
		Manual Methods		
Collocated sampling PM_{10}, TSP, $PM_{10-2.5}$	Section 3.3.1 and 3.3.5	15% within PQAO	Every 12 days PSD every 6 days	PM_{10}, TSP: 10.1% precision > 15 µg/m3 $PM_{10-2.5}$: 15.1% precision
Flow rate verification PM_{10}, TSP, $PM_{10-2.5}$, Pb-PM_{10}	Section 3.3.2	Each sampler	Once every month	≤ 4.1% of standard and 5.1% of design value
Flow rate verification PM_{10} (High-Vol), Pb-TSP	Section 3.3.2	Each sampler	Once every quarter	7.1% audit value for TSP and PM10, in addition 10.1% for PM10 design value
Semi-annual flow rate audit PM_{10}, TSP, $PM_{10-2.5}$	Section 3.3.3	Each sampler, all locations	Once every 6 months	≤ 4.1% of standard and 5.1% of design value
Semi-annual flow rate audit PM_{10} (High Vol), Pb-TSP	Section 3.3.3	Each sampler, all locations	Once every 6 months	7.1% audit value for Pb-TSP and PM10, in addition 10.1% for PM10 design value
Pb analysis audits Pb-TSP, Pb- PM_{10}	Section 3.2.4	1. Each sampler 2. Analytical (lead strips)	1. Include with TSP 2. Each quarter	1. Same as for TSP 2. ±10.1% bias

5.0 Sampling Process Design

Ambient air quality monitoring is generally performed to:

- judge compliance with and/or progress made towards meeting the National Ambient Air quality standards;
- develop, modify or activate control strategies that prevent or alleviate air pollution episodes;
- observe pollution trends throughout the state and region, including non-urban areas; and
- provide a data base for research and evaluation of trends

The following sections provide a brief overview of the entire MPCA ambient air monitoring network. For specifics such as monitoring locations, photographs, and parameters monitoring for, please refer to Minnesota's Annual Air Monitoring Network Plan[xi].

5.1 Monitoring networks

Monitoring networks consist of the following: State and Local Air monitoring Stations (SLAMS), Air Quality Index (AQI), Photochemical Assessment Monitoring Stations (PAMS), $PM_{2.5}$ Chemical Speciation Network (CSN), National Core (NCore) Network, Near-road Monitoring, National Toxics Trends Network (NATTS), Interagency Monitoring of Protected Visual Environments (IMPROVE), Clean Air Status and Trends Network (CASTNET), National Atmospheric Deposition Network (NADP), and the National Air Toxics Assessment (NATA).

Monitoring networks can be designed to meet one or more of the following six basic monitoring objectives:

- Determine the highest concentrations in the area covered by the network
- Determine representative concentrations and exposure in areas of high population density
- Determine the impact on ambient pollution levels of major sources or source categories
- Determine general background concentration levels
- Determine the extent of Regional pollutant transport to and from populated areas.
- Determine the source/transport related impacts in more rural and remote areas

MPCA currently operates networks under SLAMS, AQI, NCore, Near-road Monitoring, and Special Purpose Monitoring. Most Minnesota monitoring sites are part of the SLAMS network.

5.1.1 SLAMS

MPCA SLAMS network consists of 53 monitoring stations and is designed to determine to meet State implementation plan (SIP) requirements. To ensure quality data, the SLAMS are required to meet the following:

- Each site must meet network design and siting criteria, as specified in 40 CFR 58, Appendices D and E.
- Each site must provide adequate QA assessment, control, and corrective action functions according to minimum program requirements established in 40 CFR Part 58.
- All sampling methods and equipment must meet EPA reference or equivalency requirements as specified in 40 CFR Parts 50 and 53.
- Acceptable data validation and record keeping procedures must be followed.
- Data from the SLAMS must be summarized and reported annually to EPA

Additionally the MPCA network is operated to meet each of following six basic monitoring objectives:

1. Highest concentrations expected to occur in the area covered by the network.
2. Representative concentrations in areas of high population density.
3. Impact on ambient pollution levels of significant sources or source categories.
4. General background concentration levels.
5. Extent of regional pollutant transport among populated areas, and in support of secondary standards.
6. Environmental-economic related impacts in more rural and Class 1 areas.

These six objectives indicate the nature of the data that the monitoring network will collect which must be representative of the spatial area being studied. The monitoring aspects of the SLAMS program are found in the Code of Federal Regulations (CFR), Title 40, Parts 50, 53 and 58.

The St. Paul/Minneapolis area is impacted by both distant and local sources. The region's main industries include manufacturing, electrical utilities, retail marketing, refining, biomedical research, aviation and transportation. Local emission source categories include:

- Point sources- manufacturing, refining, menthol fuel production, waste incinerators, and power generation.
- Area sources- commercial and residential fuel combustion.
- Mobile sources- cars, trucks, off-road heavy equipment, barges, trains, and aircraft. One international airport, many smaller scale airports, and high-traffic train routes.
- Agricultural activities- fertilizer and herbicides application, tilling, and livestock.
- Biogenic sources- oxides of nitrogen from biological activity in composting facilities and soils, hydrocarbon emissions from plants and trees.

Agriculture is the main industry surrounding the St. Paul/Minneapolis Metropolitan area with corn and soybeans being the major crops.

5.1.1.1 Pollutant specific design criteria for SLAMS sites

SLAMS networks monitor for the purpose of providing timely air quality data upon which to base national assessments and policy decisions. These stations are subject to additional data reporting and monitoring methodology requirements as contained in 40 CFR Part 58 Appendix D.

Table 5-1 lists the appropriate numbers of stations for each SLAMS, as determined by population and concentrations categories specified in 40 CFR Part 58 Appendix D.

Table 5-1: SLAMS Monitoring Network Criteria

<table>
<tr><th colspan="2">Criteria for CO</th></tr>
<tr><td colspan="2">1 CO monitor is required to operate collocated with 1 required near-road NO_2 monitor, in CBSAs having a population of 1,000,000 or more persons.
(If a CBSA has more than 1 required near-road NO_2 monitor, only 1CO monitor is required to be collocated with a near-road NO_2 monitor within that CBSA.)</td></tr>
<tr><th colspan="2">Criteria for Pb</th></tr>
<tr><td>Category</td><td>Required number of stations</td></tr>
<tr><td>Maximum Pb concentration in excess of NAAQS</td><td>All sites in excess</td></tr>
<tr><td>Non-airport Pb source emitting 0.50 or</td><td>≥1</td></tr>
</table>

more tons/year Airports which emit 1.0 or more tons/year (based on most recent NEI)	≥1

Criteria for NO_2

Population Category	Required number of stations
>2,500,000 w/AADT 250,000 or greater >500,000	2 near road 1 microscale

Criteria for O_3

Population Category	Most recent 3-year design value concentrations ≥85% of any O_3 NAAQS	Most recent 3-year design value concentrations <85% of any O_3 NAAQS		
>10,000,000	4	2	NA	NA
4-10 million	3	1		
350,000- <4 million	2	1		
50,000- <350,000	1	0		

Criteria for PM_{10}

Population Category	High concentration (exceeds NAAQS by 20% or more)	Medium concentration (exceeds NAAQS by 80% or more)	Low concentration (concentrations less than 80% of NAAQS)
> 1,000,000	6-10	4-8	2-4
500,000-1,000,000	4-8	2-4	1-2
250,000-500,000	3-4	1-2	0-1
100,000-250,000	1-2	0-1	0

Criteria for SO_2

Population Weighted Emissions Index (PWEI) SO_2 Emissions (tons/year)	Minimum required number SO_2 stations
200,000 100,000-200,000 5,000-100,000	3 2 1
>200,000 100,000-200,000 20,000-100,000 >20,000	3 2 1 0
>100,000 20,000-100,000 <20,000	2 1 0

5.1.1.2 Near-road monitoring

In February of 2010, the EPA finalized new minimum monitoring requirements for the NO_2 monitoring network in support of a 1-hour NO_2 NAAQS. In the new monitoring requirements, state and local air monitoring agencies are required to install near-road NO_2 monitoring stations at locations where peak hourly NO_2 concentrations are expected to occur within the near-road environment in large urban areas. In August of 2011 and December of 2012, the EPA extended the near-road monitoring requirements to the national CO and PM2.5 monitoring networks, respectively.

According to 40 CFR Part 58 Appendix D, state and local air agencies are required to operate one near-road monitoring site in each Core Based Statistical Area (CBSA) with a population of 500,000 or more people. In addition, CBSAs with 2,500,000 or more people, or those CBSAs with one or more roadway segments carrying traffic volumes of 250,000 or more vehicles per day are required to operate two near-road monitoring sites. The Minneapolis-St. Paul- Bloomington CBSA is the only CBSA in Minnesota that requires near-road monitoring. The 2013 population estimate for the Minneapolis-St. Paul-Bloomington CBSA is 3,459,146 people, triggering the requirement for a second near-road monitoring site within the CBSA.

The first near-road air monitoring site in the Twin Cities metropolitan area is located along I-94 & I-35W freeway commons in Downtown Minneapolis (figure 6). This site is located along the traffic segment with the highest ranked Fleet Equivalent Annual Average Daily Traffic (FE-AADT) count. The FE-AADT ranks traffic segments based on total daily vehicle traffic, with extra weight given for traffic segments with more heavy duty truck traffic. More information on the site selection process for the first near-road monitoring site is available in the following PDF report, http://www.pca.state.mn.us/index.php/view-document.html?gid=17857.

The second near-road air monitoring site in the Twin Cities metropolitan area is located along I-35 & Kenyon Ave in Lakeville. Due to physical considerations, near-road siting criteria, and general logistics, the second site could not accommodate the specified locations for the second, third, and fourth ranked traffic segments. Table 5-2 lists the parameters at each of the near-road sites.

Table 5-2: Near-road parameters

MPCA Site ID	City Name	Site Name	$PM_{2.5}$ FEM	TSP and Metals	Ozone	Oxides of Nitrogen	Carbon Monoxide	VOCs	Carbonyls	Other Parameters
962	Minneapolis	Near-road Minneapolis	X	X	X	X	X	X	X	Meteorological, ultrafine particle counter, black carbon, PAHs
480	Lakeville	Near-road Lakeville	X			X	X			Meteorological

5.1.1.3 Air Quality Index (AQI)

The AQI was developed by the EPA to provide a simple, uniform way to report daily air quality conditions. Minnesota AQI numbers are determined by hourly measurements of five pollutants: $PM_{2.5}$, ground-level O_3, SO_2, NO_2, and CO. The pollutant with the highest value determines the AQI for that hour. The most common pollutants to drive the AQI are $PM_{2.5}$ and O_3. AQI values are updated hourly and posted on the MPCA's website at www.pca.state.mn.us/aqi. There are 24 sites in the AQI network in Minnesota.

5.1.2 NCore

In October 2006, the EPA established the NCore multi-pollutant monitoring network in its final amendments to the ambient air monitoring regulations for criteria pollutants (codified in 40 CFR parts 53 and 58). EPA requires each state to have at least one NCore site. At a minimum NCore monitoring sites must measure the parameters listed in Table 5-3.

Table 5-3: NCore parameters

NCore parameters	Parameter Comments

$PM_{2.5}$ speciation	Organic and elemental carbon, major ions and trace metals (24 hour average every 3rd day)
$PM_{2.5}$ FRM mass	24 hour average every third day
continuous PM2.5 mass	one hour reporting interval
continuous $PM_{10-2.5}$ mass	in anticipation of a $PM_{10-2.5}$ standard
lead (Pb)	24 hour sample every sixth day
ozone (O_3)	continuous monitor consistent with other O_3 sites
carbon monoxide (CO)	trace level continuous monitor capable of trace levels (low ppb and below)
sulfur dioxide (SO_2)	trace level continuous monitor capable of trace levels (low ppb and below)
total reactive nitrogen (NO/NO_y)	continuous monitor capable of trace levels (low ppb and below)
surface meteorology	wind speed and direction, temperature, barometric pressure, and relative humidity

In 2011, the MPCA began operating the full suite of NCore parameters at the Anoka County Airport in Blaine. The Anoka County Airport monitoring station is located approximately 11 miles north of downtown Minneapolis and approximately 15 miles northwest of downtown St. Paul. A detailed report about Minnesota's NCore site in Blaine can be found on the MPCA website at www.pca.state.mn.us/air/monitoringnetwork.html. It is Appendix B of the 2010 Annual Air Monitoring Network Plan for the State of Minnesota. Minnesota's NCore site focuses on providing multi-pollutant monitoring data. Numerous chemical and physical interactions between pollutants underlie the formation of particulates and ozone and the presence of other pollutants. In addition, emission sources tend to release multiple pollutants or their precursors simultaneously. Multi-pollutant monitoring will benefit health studies, long-term epidemiological studies, source apportionment studies, and air quality models.

Another focus of the NCore site in Blaine is trace level monitoring of carbon monoxide, sulfur dioxide, oxides of nitrogen, and total reactive nitrogen. These pollutants are dominant inorganic combustion products, as well as the most abundant inorganic elements in the atmosphere. Emissions reductions have reduced the concentrations of these pollutants in most urban and rural areas; however, they are precursor gases that continue to play an important role in the formation of ozone, particulate matter, and air toxics on both local and regional scales. The trace level data that this site provides will help us understand the role of these pollutants in the environment at levels far below the NAAQS. Trace level monitors have been at the NCore site in Blaine since 2009; however, due to performance issues with the monitoring equipment, trace level monitoring results have been unreliable. The MPCA replaced the trace level monitoring instruments in late 2013. These instruments have been more reliable; the Agency is still awaiting final guidelines for NCore operations from the USEPA.

5.1.3 SPMS

SPMS provide for special studies needed by the State and local agencies to support their SIP's and other air program activities. The SPMS are not permanently established and, thus, can be adjusted easily to accommodate changing needs and priorities. The SPMS are used to supplement the fixed monitoring network as circumstances require and resources permit. If the data from SPMS are used for SIP purposes, they must meet all QA and methodology requirements for SLAMS monitoring.

5.2 Monitoring objectives and spatial scales

The goal in siting stations is to determine the most appropriate spatial scale represented by the sample of monitored air. Representative measurement scales of greatest interest are:

Micro - Concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters

Middle - Concentrations typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer

Neighborhood - Concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range

Urban - citywide conditions with dimensions on the order of 4 to 50 kilometers. This scale would usually require more than one site

Regional - Usually a rural area of reasonably homogeneous geography and extends from tens to hundreds of kilometers

National/Global - Concentrations characterizing the nation and the globe as a whole

Table 5-4 illustrates the relationships among the four basic monitoring objectives and the scales of representativeness.

Table 5-4: Relationship among monitoring objectives and scales of representativeness

Monitoring Objective	Appropriate Siting Scale
Highest Concentration	Micro, middle, neighborhood, sometimes urban
Population	Neighborhood, urban
Source impact	Micro, middle, neighborhood
General/background	Neighborhood, regional
Regional Transport	Urban, regional
Enviro-economic	Urban, regional

5.3 Monitoring boundaries

The NAAQS refer to monitoring boundaries as part of meeting monitoring objectives; these boundaries are defined below. Definitions are derived from the document entitled *Guidance for Network Design and Optimum Site Exposure for $PM_{2.5}$ and PM_{10}*[xii].

Metropolitan Statistical Area (MSA) are designated by the U.S. Office of Management and Budget (OMB) as having a large population nucleus, together with adjacent communities having a high degree of economic and social integration with that nucleus. MSA boundaries correspond to portions of counties that often include urban and non-urban areas. MSAs are useful for identifying which parts of a state have sufficient populations to justify the installation of a compliance monitoring network. Their geographical extent may be too big for defining the boundaries of Metropolitan Planning Areas and Community Monitoring Zones.

Primary Metropolitan Statistical Area (PMSA) are single counties or groups of counties that are the component metropolitan portions of a mega-metropolitan area. PMSAs are similar the MSAs with the additional characteristic of having a degree of integration with surrounding metropolitan areas.

Consolidated Metropolitan Statistical Area (CSA) are a group of PMSAs having significant economic and social integration.

New England County Metropolitan Statistical Area (NECMSA) is a county-based alternative for the city- and town-based New England MSAs and CMSAs.

Monitoring Planning Area (MPA) and **Community Monitoring Zone (CMZ)** The **MPAs** are defined by SIPs as the basic planning units for $PM_{2.5}$ monitoring. The **CMZ,** is applicable only to $PM_{2.5}$, and is intended to represent spatial uniformity of $PM_{2.5}$ concentrations. Both units are discussed in further detail in the MPCA Quality Assurance Plan for $PM_{2.5}$.

6.0 Training Requirements and Qualifications

The development of operational procedures for training is required under 40 CFR Part 58 Appendix A. Such training may consist of classroom lectures, workshops, teleconferences and on-the-job training. The following sections detail the MPCA's current training requirements; this section will be updated as necessary.

6.1 Training

The Air Monitoring Unit Supervisor ensures all air monitoring staff are adequately trained and able to perform their duties in a proficient and effective manner and the Environmental Data Quality Supervisor will ensure that all Quality Assurance staff are trained to perform their work. The MPCA has utilized training through the Air Pollution Training Institute, Air & Waste Management Association, Lake Michigan Air Directors Consortium, and a number of web trainings and conference calls hosted by the EPA; all of which have a number of courses covering ambient air monitoring and quality assurance.

Table 6-1 represents the minimum level of training each position assigned to criteria pollutant monitoring must complete prior to performing task assignments. Completed training is documented in personnel files, logbooks, or work plans.

Table 6-1: MPCA Training requirements for criteria ambient air monitoring program

Job Classification	Training Requirement
Field Personnel	Field Safety Training Monitor manufacturers' operational manuals MPCA SOPs State of Minnesota Defensive Driving course MPCA QAPP
Laboratory Personnel	Monitor manufacturers' operational manuals Safety Training MPCA SOPs Balance Room Manufacturers' Training MPCA QAPP
Quality Assurance Staff	Safety Training Monitor manufacturers' operational manuals MPCA SOPs State of Minnesota Defensive Driving course MPCA QAPP FRM Performance Evaluation Training Balance Room Manufacturers' Training Data Quality Assessment Quality Assurance for Air Pollution Measurement Systems Data Validation training
Data Management	AQS Training Balance Room Manufacturer's Training MPCA QAPP Data Quality Assessment Data Validation training

6.2 Evaluations and refresher training

Keeping staff up-to-date in training is crucial for developing and maintaining a quality monitoring program. MPCA staff are evaluated by the appropriate Unit Supervisor annually to determine specific training needs and job proficiency. With frequent updates and revisions to rules, policies, and guidance for criteria air pollutant monitoring, refresher training is sought as available and as needed.

7.0 Sampling Methods

The purpose of this section is to describe the attributes of the MPCA sampling system that ensure the collection of acceptable data.

7.1 Monitor equivalency

The CFR requires that any monitor operated for the purpose of comparison to the NAAQS must have a Federal Reference or Equivalent Method Designation. Except as otherwise provided in 40 CFR Part 58, Appendix C, no reference method, equivalent method, or alternative method may be used in a SLAMS if it has been modified in a manner that will, or might, significantly alter the performance characteristics of the method without prior approval by the Regional Administrator. The MPCA will only deploy criteria pollutant air monitors that have Federal Reference or Equivalent Method Designation.

7.2 Sampling equipment general guidelines

Sampling equipment requirements are generally divided into two categories, consistent with the desired averaging times:

1. Continuous- pollutant concentrations determined with automated methods, and recorded or displayed continuously.
2. Integrated- pollutant concentrations determined with manual or automated methods from integrated hourly or daily samples on a fixed schedule.

The MPCA operates a mix of continuous and integrated methods at each site. Where possible the MPCA has upgraded and will continue to upgrade monitors to continuous methods; most collocated monitors are currently integrated.

7.3 Site location

Monitoring stations are often located in urban areas where space and land are at a premium, especially in the Twin Cities Metro Area, where monitoring for NO_x and CO is necessary. The MPCA prefers to locate their air monitoring equipment in a stand-alone shelter with limited access, or will modify existing rooms to the recommended station design if funds and staff time is available. Depending on the sampling objective, monitoring sites are oriented to measure the following:

1. Impacts of known pollutant emission categories on air quality.
2. Population density relative to receptor-dose levels, both short and long term.
3. Impacts of known pollutant emission sources (area and point) on air quality.
4. Representative area-wide air quality.

The selection of the number, location, and type of sampling station is a complex process. The variability of sources including their intensities of emissions, terrains, meteorological conditions, and demographic features, require individual site assessments. The selection of monitoring sites also involves consideration of the following factors:

Economics - The amount of resources required for the entire data collection activity, including instrumentation, installation, maintenance, data retrieval, data analysis, quality assurance and data interpretation.

Security – In certain areas, a location may not be suitable for the establishment of an ambient monitoring station simply due to the lack of security for the equipment. If problems cannot be remedied by use of standard security measures such as fences, lighting, etc., then attempts will be made to locate as close to the preferred location as possible while maintaining adequate security.

Logistics - Logistics is the process of equipment procurement, maintenance, training, inventory, scheduling, and material and personnel transport for a monitoring operation. In many cases, a monitoring station is located in a building or school that has a lease agreement with the agency. Sometimes, a storage or janitorial closet is all that is available; however, this can pose serious problems. If the equipment is located in a closet, then it is difficult for the agency to control the temperature, humidity, light, vibration and chemicals that the instruments are subjected to.
Atmospheric considerations - Atmospheric considerations may include spatial and temporal variability's of pollutants and their transport. Effects of buildings, terrain, and heat sources or sinks on the air trajectories can produce local anomalies of excessive pollutant concentrations. Meteorology must be considered in determining not only the geographical location of a monitoring site but also such factors as height, direction, and extension of sampling probes; seasonal wind directions must always be a major consideration as well.

7.4 Monitor placement

Final placement of a monitor may be compromised by physical obstructions and activities in the immediate area including accessibility to utilities and other support. Since obstructions such as trees and buildings can significantly alter the air flow in a given location, it is imperative that the guidelines described in 40 CFR Part 58 Appendix E for placement of sampling probes be followed.

In many cases, a monitoring station is located in a building or school that has a lease agreement with the agency. Sometimes, a storage or janitorial closet is all that is available; however, this can pose serious problems. If the equipment is located in a closet, then it is difficult for the agency to control the temperature, humidity, light, vibration and chemicals that the instruments are subjected to.

7.5 Monitoring station design and setup

To establish the basic validity of each ambient air monitoring station and corresponding data, the MPCA will demonstrate that each station is designed to conform to the following:

- the proposed sampling method complies with the Federal Reference or Equivalent Method Designation.
- the equipment is sited in compliance 40 CFR Part 58 Appendices D and E
- the equipment was accurately calibrated using correct and established calibration methods
- the operational personnel implementing the data collection and operation are qualified and competent

The MPCA has utilized small utility trailers as monitoring shelters; however, in some areas, this will not suffice, as local building codes may not allow this type of structure. Recently, the MPCA has purchased small manufactured steel and aluminum buildings designed to contain instruments with adequate work space in an air conditioned environment to maintain a temperature range of 20°C to 30°C.

7.6 Design of probes and manifolds

Probes and manifolds must be placed to avoid introducing bias to the sample. Important considerations are probe height above the ground, probe length (for horizontal probes), and physical influences near the probe. The following are general guidelines for probe and manifold placement:

- probes should not be placed next to air outlets such as exhaust fan openings
- horizontal probes must extend beyond building overhangs
- probes should not be near physical obstructions such as chimneys which can affect the air flow in the vicinity of the probe

- height of the probe above the ground depends on the pollutant being measured and spatial scale

Table 7-1 provides a summary of probe and monitoring path siting criteria based on the pollutant to be monitored. An alternative site may need to be considered if the criteria for probe design or placement cannot be met.

Table 7-1: Summary of probe and monitoring path siting criteria

Pollutant	Maximum monitoring path[A] length (meters)	Height from ground to probe, inlet, or 80% of monitoring path[A] (meters)	Horizontal and vertical distance from supporting structures[B] to probe, inlet, or 90% of monitoring path[A] (meters)	Distance from trees to probe, inlet or 90% of monitoring path[A] (meters)	Distance from roadways to probe, inlet or monitoring path[A] (meters)
SO_2[C,D,E,F]	Middle (300m) Neighborhood, Urban, and Regional (1 km)	2 - 15	>1	>10	N/A
CO[D,E,G]	Middle (300m) Neighborhood (1 km)	2.5 - 3.5; 2 -7; 2 - 15	>1	>10	2-10 for downtown areas or street canyon microscale; ≤50 for near-road microscale
O_3[C,D,E]	Middle (300m) Neighborhood, Urban, and Regional (1 km)	2 - 15	>1	>10	
NO_2[C,D,E]	Micro (Near-road (50-300m) Middle (300m) Neighborhood, Urban, and Regional (1 km)	2 – 7 (micro) 2 – 15 (all other scales)	>1	>10	≤50 for near-road microscale
Pb[C,D,E,H]	Middle (300m) Neighborhood, Urban, and Regional (1 km)	2-7 (micro); 2-15 (all other scales)	>2 (all scales, horizontal distance only)	>10 (all scales)	2 – 10 (micro); ≤50 for near-road
PM[C,D,E,H]	Middle (300m) Neighborhood, Urban, and Regional (1 km)	2-7 (micro and near-road); 2-15 (all other scales)	>2 (all scales, horizontal distance only)	>10 (all scales)	2 – 10 (micro); ≤50 for near-road

A- Monitoring Path for open path analyzers is applicable only to middle or neighborhood scale CO monitoring, middle, neighborhood, urban, and regional scale NO_2 monitoring, and all applicable scales for monitoring SO_2, O_3, O_3 precursors,

B- When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof

C- Should be >20 meters from the dripline of tree(s) and must be 10 meters from the dripline when the trees(s) act as an obstruction

D- Distance from sampler, probe, or 90% of monitoring path to obstacle, such as a building, must be at least twice the height the obstacle protrudes above the sampler, probe or monitoring path. Sites not meeting this criterion may be classified as middle scale.

E- Must have unrestricted air flow 270° around probe or sampler; 180° if the probe is on the side of a building

F- The probe, sampler, or monitoring path should be away from minor sources, such as a furnace or incineration flues. The separation distance is dependent on the height of the minor source's emission point (such as a flue), the type of fuel or waste bed, and the quality of fuel (sulfur, ash, or lead content). This criterion is designed to avoid undue influences from minor sources.

G- For microscale CO monitoring sites, the probe must be >10 meters from a street intersection and preferably at a midblock location.

H- Collocated monitors must be within 4 meters of each other and at least 2 meters apart for flow rates greater than 200lpm or at least 1 meter apart for samplers having flow rates less than 200lpm to preclude airflow interference unless a waiver is in place as approved by the Regional Administrator.

When determining how to set up a sampling station concerning probes, inlets and sampling materials, monitoring organizations have the option of the following:

1) using individual Teflon® sampling which may access the ambient air through one port (with a number of individual lines) but each line would run directly to an analyzer.

2) using glass manifolds which allow for ambient air to enter from a single inlet, collect in the manifold and then be distributed through manifold outlet ports in individual analyzers.

Either method is appropriate and it may depend on the number of analyzers at the site, how the shelter is configured for access, and what resources are available for maintenance and cleaning.

7.6.1.1 Probe and manifold maintenance

After an adequately designed sampling probe and/or manifold has been installed, the following steps are implemented to maintain constant sampling conditions:

1. Conduct a leak test at the time of installation, after any changes in placement, and on a semi-annual basis.
2. Establish cleaning techniques and a schedule. A large diameter manifold may be cleaned by pulling a cloth on a string through it. Otherwise, the manifold should be disassembled periodically and cleaned with distilled water (soap, alcohol, or other products that may contain hydrocarbons and should be avoided when cleaning the sampling train). These products may leave a residue that may affect volatile organic measurements. Visible dirt should not be allowed to accumulate.
3. Plug the ports on the manifold when sampling lines are detached.
4. Maintain a flow rate in the manifold that is 3 to 5 times the total sampling requirements or at a rate equal the total sampling requirement plus 140 L/min. Either way will help to reduce the sample residence time in the manifold and ensure adequate gas flow to the monitoring instruments.
5. Maintain the vacuum in the manifold <0.64 cm water gauge. Maintaining a low vacuum will ensure that no leaks are present.
6. Probe lines must be inspected on an annual basis to determine cleanliness and integrity. All probe lines will be replaced on a bi-yearly schedule, regardless of condition.

7.6.1.2 Residence Time Determination

No matter how nonreactive the sampling probe material may be, after a period of use, reactive particulate matter becomes deposited on the probe walls. Therefore, the time it takes the gas to transfer from the probe inlet to the sampling device is critical. Ozone, in the presence of nitrogen oxide (NO), will show significant losses even in the most inert probe material when the residence time exceeds 20 seconds. Other studies indicate that a 10 second or less residence time is easily achievable. Sampling probes for reactive gas monitors at NCore and NO_2 sites must have a sample residence time less than 20 seconds.

Residence time is defined as the amount of time that it takes for a sample of air to travel from the opening of the inlet probe (or cane) to the inlet of the instrument and is required to be less than 20 seconds for reactive gas monitors. The residence time of pollutants within a sampling manifold and sample lines to the instruments must be less than 10 seconds (of the total allowable 20 seconds). If the volume of the manifold does not allow this to occur, then a blower motor or other device (vacuum pump) can be used to decrease the residence time. The residence time for a manifold system is determined in the following way. First the volume of the cane, manifold and sample lines must be determined using the following equation:

Total Volume = Cv +Mv + Lv

Where:
Cv = Volume of the sample cane and extensions, cm3
Mv = Volume of the sample manifold and trap, cm3
Lv = Volume of the instrument lines, cm3
Each of the components of the sampling system must be measured individually. To measure the volume of the components (assuming they are cylindrical in shape), use the following equation:

$V = \pi * (d/2)^2 * L$

Where:
V = volume of the component, cm^3
$\pi = 3.14$
L = Length of the component, cm
d = inside diameter of the component, cm

Once the total volume is determined, divide the total volume by the total sample flow rate of all instruments to calculate the residence time in the inlet. If the residence time is greater than 20 seconds, attach a blower or vacuum pump to increase the flow rate and decrease the residence time.

The MPCA ambient air monitoring program has chosen to place individual sample lines outside of shelters for each instrument. Sample lines are manufactured out of polytetrafluoroethylene (PTFE), perfluoroalkoxy (PFA), or fluoroethylpropylene (FEP) Teflon, which are all acceptable by EPA. Advantages to using single sample lines are no breakage and ease of external auditing. Additionally lines are easily replaced as opposed to having to clean delicate glass manifolds; lines are generally changed yearly. The monitoring program carefully inspects the sample lines on a monthly basis for any signs of blockage and protects the majority of the line length from the elements via housing in conduit pipe. The monitoring program also ensures line integrity by following these EPA recommendations:

1. For three-way tee lines used for supplying calibration mixtures, calibration gas is supplied on a periodic basis to flood the entire sample line by placing the tee near the outmost limit of the sample inlet tubing.
2. Calibration gases must be delivered to the analyzers at or near ambient pressure. If calibration gas flow is excessive the analyzer may sample the gas under pressure; if a pressure effect on calibration gas is suspected, it is recommended that the gas be introduced at more than one place in the sampling line. If response to the calibration gas is the same regardless of delivery point then there is likely no pressure effect.

8.0 Lead, PM_{10}, and TSP Sample Handling and Custody

Accurate collection of particulate data depends on the proper handling of samples in the field, in transit, and in the analytical phases of processing the sample including filter storage. Chain of sample custody is imperative for sample tracking and integrity.

8.1 Sample handling

Only the manual methods of lead and particulates (TSP and PM_{10}) require actual handling of the sample; continuous PM_{10} sampling methods do not apply. One must pay particular attention to the handling of the filters. It has been suggested that the process of filter handling may be where the largest portion of measurement error occur. Due to the manner in which concentrations are determined, it is critical that samples are handled as specified in SOPs.

Sampling media are prepared in the MPCA laboratory and placed in a designated place for pick up by a field operator. The operator installs the appropriate filter for the date and sampling location based upon EPA's National Sampling Schedule. After sampling, the operator documents relevant line items on the protective outer envelope that will hold the sampled filter, including field comments (e.g. fire in area, high winds, etc.) and, when necessary, notification if the sample is invalid and the reason for the invalidation. The sample is transported back to the MPCA laboratory for analysis and data submission.

8.2 Chain of Custody

To ensure sample integrity, Chain of custody forms are necessary if the sample media is to be shipped to an outstate sites. The MPCA has a form that is utilized for this purpose. See Attachment A.

8.3 Pre-sampling

Filters received by the MPCA from the EPA supplier are first inspected for pin holes, cracks, and rips as specified in Table 8-1.

Table 8-1: Pre-sampling filter inspection

Pre Sampling				
Activity	Frequency	Responsible Staff/Section	Acceptance Criteria	Corrective Action
Filter inspection	Upon sample receipt	Laboratory analyst/technician	No pinholes or tearing	1. If additional filters are available use one that is not compromised. 2. Use new field blank filters as sample filters. 3. Obtain new filter from the lab or supplier.

Filters that pass this inspection are then placed in a filter rack and allowed to equilibrate in the TSP/PM_{10} weighing room at least 24 hours before initial weighing. Filters must demonstrate equilibrium by meeting all pertinent quality control guidelines, Table 8-2 provides guidelines for quality control.

Once equilibrium has been established, filter identification numbers are keyed into the LIMS system, a bar coded sticker is generated for that filter, and the filter is initially weighed. The initial weights are recorded into the LIMS system. The bar coded sticker is attached to the filter's associated protective outer envelope. The initially weighed filter is placed back in the box it arrived in from the EPA ready for use by field operators. When ready for deployment the filter is removed from the box and then carefully installed into a cassette holder and covered with a protective metal cover plate. The filter is now ready for transport to a sampling site.

Table 8-2: PM conditioning room quality control guidelines

PM Conditioning Room Quality Control				
Activity	Frequency	Responsible Staff/Section	Acceptance Criteria	Corrective Action
Room Temperature	Before and during each weighing session	Laboratory analyst/technician	20-30°C	1. Wait for temperature to be achieved; 2. Notify QA Coordinator; 3. Call service provider holding maintenance agreement; 4. Document in electronic log; 5. Notify Air Monitoring Unit Supervisor
Room Temperature Control	Each filter	Laboratory analyst/technician	2°C SD over 24 hours	1. Wait for temperature to be achieved; 2. Notify QA Coordinator; 3. Call service provider holding maintenance agreement; 4. Document in electronic log; 5. Notify Air Monitoring Unit Supervisor
Room Humidity	Before and during each weighing session	Laboratory analyst/technician	30-40%	1. Wait for humidity to be achieved; 2. Notify QA Coordinator; 3. Call service provider holding maintenance agreement; 4. Document in electronic log; 5. Notify Air Monitoring Unit Supervisor
Room Humidity	Each filter	Laboratory analyst/technician	5% SD over 24 hours	1. Wait for humidity to be achieved; 2. Notify QA Coordinator; 3. Call service provider holding maintenance agreement; 4. Document in electronic log; 5. Notify Air Monitoring Unit Supervisor
Comparison of NIST Standards to laboratory and working primary standards	Yearly or as needed	Laboratory analyst/technician	± 1g	1. Contact Mettler Toledo service representative; 2. Notify QA Coordinator and Air Monitoring Unit Supervisor
HVAC preventative maintenance	Yearly or as needed	Laboratory analyst/technician	N/A	Contact MPCA maintenance

8.4 Sampling TSP/Pb and PM_{10}

PM samples are collected following the **U.S. EPA's Sampling Schedule Calendar.** Samples are taken out to the field for set-up by the AMU field operators. The operators record the date and time of sample set-up and verify the established run date on filters' protective outer envelope. Flow charts are also fitted when needed to record sampler flow throughout the sampling period. Table 8-3 provides an overview of the main quality controls for particulate sample collection.

Table 8-3: Quality control activities for sample collection

Continuous PM10 FRM Sampler				
Activity	Frequency	Responsible Staff/ Section	Acceptance Criteria	Corrective Action
Sampling Period	Hourly (24hours)	Field operators	75% of the hours are valid or if substituting 0 for missing hours still results in an exceedance of the daily standard.	Investigate/invalidate
Average Flow Rate	Each sample	Field operators	4.1% of 16.7 lpm	Investigate/invalidate
Flow Verification	Monthly	Field operators	4.1% of 16.7 lpm	Inform Quality Assurance
Calibration	Yearly	Calibrator Specialist	3 points	Investigate; note downtime in analyzer logbook; inform Quality Assurance
TSP/PM10 Manual Sampler				
Sampling Period	Each sample	Field operators	24 ±1 hour	Investigate/invalidate
Average Flow Rate	Each sample	Field operators	10% of 40 CFM	Investigate/invalidate
Flow Verification	Monthly	Field operators	7.1% of audit flow rate	Investigate/invalidate
Sample Retrieval Time	Each sample	Field operators	Within 177 hrs of start time	Notify QA Coordinator
Calibration	One-time	Manufacturer	Manufacturer specifications	N/A
Collocated Samples	1 per 12 days at 15% of sites	Field operators	CV <10.1% of samples >15µg/m^3	Notify QA Coordinator

8.5 Post Sampling

After samples have been exposed, each filter cassette is removed from the sampler as soon as possible and covered with a protective metal cover plate. Sampler operational data is recorded including retrieval time, sampling time (both start and ending times)and start and ending magnahelic readings. The flow chart is returned with the filter. The sample filters are then transported back to the MPCA air laboratory. The sample filters are unloaded from the cassette holders, placed in the filter rack, and allowed to equilibrate for at least 24 hours before final weighing. Filters are then weighed and final weights are recorded in LIMS along with the correlating flow and time data for that sample. Table 8-4 describes quality control for sample recovery and analysis. The LIMS system automatically calculates the final concentration of particulate mass and stores the results. Weighed filters are placed in glassine envelopes which in turn are placed into the associated protective outer envelope.

Table 8-4: Quality control activities for sample recovery and analysis

PM_{10} Mass				
Activity	**Frequency**	**Responsible Staff/Section**	**Acceptance Criteria**	**Corrective Action**
Balance Check	Beginning, 10th sample, end	Lab Manager	±0.5mg of true zero and ±0.5mg of the 5g check weight	Reweigh; Document in room log; contact manufacturer
Duplicate Weighing	Tare weights Final weights	Lab Manager	±1mg change from original value ±2mg change from original value	Document in room logbook; contact MTL
Collocated Samples	1 per 12 days at 15% of sites	Lab Manager	CV <10.1% of samples >15μg/m^3	Notify QA Coordinator
Integrity- random sample of test field blank filters	10%	Lab Manager	±5.1 μg/m^3	Notify QA Coordinator
Lead Analysis				
Initial Calibration (IC)	Daily, at least 4 calibration points	Lab Manager	Correlation coefficient >0.995	1) Repeat analysis of calibration standards. 2) Re-prepare calibration standards and re-analyze
Initial Calibration Verification (ICV)	Immediately after IC	Lab Manager	Recovery 90-110%	1) Repeat analysis of calibration check standard 2) Repeat analysis of calibration standards 3) Re-prepare calibration standards and re-analyze
Initial Calibration Blank (ICB)	Immediately after ICV	Lab Manager	Analytes below MDL	1) Locate and resolve contamination problems before continuing 2) Reanalyze
High Standard Verification (HSV)	Following ICB analysis	Lab Manager	Recovery 95-105%	1) Repeat analysis of HSV 2) Re-prepare HSV
Lab Control Standard (LCS)	Following ICB, before the first sample and at the end of each run	Lab manager	Recovery 85-115%	1) Repeat analysis of ICS 2) Re-prepare ICS
Continuing Calibration Verification (CCV)	Analyze before 1st sample, after every 10 samples and at the end of each run	Lab Manager	Recovery 85-115%	1) Repeat analysis of continuing calibration verification sample 2) Re-prepare continuing calibration 3) Reanalyze samples since last acceptable calibration verification
Reagent Blank (RB)	1 per 20 samples, minimum of 1 per batch	Lab Manager	Analytes below MDL	1) Reanalyze 2) Re-prepare blank and reanalyze 3) Repeat analyses of all samples since last clean blank
Method Blank Spike	1 per 20 samples,	Lab Manager	Recovery 80-120%	1) Re-prepare sample 2) Reanalyze

	minimum of 1 per batch			
Sample Spike	1 per 20 samples, minimum of 1 per batch	Lab Manager	Recovery 75-125%	1) Re-prepare sample batch 2) Reanalyze
Duplicate Samples	1 per batch	Lab Manager	RPD <15%	1) Repeat analysis 2) Re-prepare
Collocated Samples	Once every 10 samples	Lab Manager	±30% for >5x MDL	Investigate and discuss with Air Monitoring Supervisor and QA Coordinator

8.6 Collocated samples

Collocated samples are collected by placing a sampler in the same location as the primary sample as specified in 40 CFR Part 58 Appendix A. Collocated PM samples are collected on a 1-in-6 day schedule. If the primary sampler does not operate correctly or collected data was invalid, valid collocated data can be substituted for the particular samples missed by the primary sampler. If the CV values exceed the criteria, then sample and analysis techniques are investigated to determine the cause of the high variability.

8.7 Collection Errors

All sampling systems will suffer a failure from time to time. It is the responsibility of the field operator to inform the Operations Field Coordinator and Laboratory Manager of any failure. In addition, the field operator must ensure that all sample labels are clearly marked that the sample failed and why. The operator must also ensure that corrective actions necessary to remedy the problem are engaged.

8.8 Filter archive

Filters will be archived in the bar-coded sample envelope. Each filter will be stored in the laboratory sample file for a minimum of 5 years. All pertinent raw data, data flags or other hard copy information regarding each sample will be maintained for a minimum of 5 years.

9.0 Quality Control Requirements

Quality Control (QC) activities measure the attributes and performance of the monitoring process. QC activities are used to ensure measurement uncertainty is maintained within acceptance criteria for the attainment of the MQOs. QC is both corrective and proactive in establishing techniques to prevent the generation of unacceptable data.

9.1 Quality systems

For the Ambient Air Criteria Monitoring Program, 40 CFR Part 58 Appendix A and the federal reference and equivalent methods discuss a number of QC checks that are to be used. The MQO tables included in Part 7 of this QAPP also identify the most critical QC samples. In addition, representatives from Quality Assurance visit each site 2 times per year at a minimum for analyzer and site audits to ensure systems integrity.

9.2 Routine operational checks

The MPCA field operators will conduct zero, span, and precision checks on each continuous instrument under their control, at a minimum of once every two weeks. Operators may conduct remote zero, span, and precision checks through automated systems but are required to conduct site visits every two weeks. The results of which will be entered into the LIMS system upon returning to the MPCA Air Laboratory. Table 9-1 lists the acceptable QC performance criteria for zero, span, precision and uptime.

Table 9-1: QC performance criteria

Parameter	Zero* Adjust	Zero Reject	Span* Adjust	Action ** Level	Span Reject	Sampling Time
Sulfur Dioxide	≤ ±1.5 ppb	>3.0 ppb in 24-hours >5.0ppb in 14 days	≤ ± 10.1% of value	> 8% of value	>10.1 % of value	Minimum of 75% of the sampling interval
Ozone	≤ ±1.500 ppb	>3.00 ppb in 24-hours >5.00ppb in 14 days	≤± 7.1% of value	>5 % of value	>7.1 % of value	Minimum of 75% of the sampling interval
Nitrogen Oxides	≤ ±1.5 ppb	>3.0 ppb in 24-hours >5.0ppb in 14 days	≤ ± 10.1% of value	> 8% of value	>10.1 % of value Converter Efficiency <96% (should be between 96%-104%)	Minimum of 75% of the sampling interval
Carbon Monoxide	≤± 0.3 ppm	>0.4 ppm in 24-hours >0.6 ppm in 14 days	≤ ± 10.1% of value	> 8% of value	> 10.1% of value	Minimum of 75% of the sampling interval

*Operators may adjust within this range
** Requires calibration with transfer standard

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9.3 Use of LIMS for quality control

The MPCA utilizes a StarLIMS system that can process QC information rapidly.
Field operators input all essential QC data in to the LIMS system on a regular basis including calibration and audit results. The system is then able to process the data and provide the following:

- compute calibration equations and measures of linearity of calibrations
- plot calibration curves and zero/span drift data
- compute precision and accuracy results and control chart limits
- automatically flag out-of-control results
- maintain and retrieve calibration and performance records

10.0 Testing, Inspection, and Maintenance

All equipment used to produce data are tested, inspected, and maintained in sound condition by senior air monitoring staff. Any piece of new equipment failing inspection must be returned to the manufacture. Every piece of equipment has an expected life span of ten years. Through proper testing, inspection, and maintenance, the MPCA ensures its equipment is capable of operating at acceptable performance levels. Due to the large variety of equipment used in the Ambient Air Criteria Monitoring Program, this section will not provide guidance on each type of equipment. In most cases, the manufacturers of the equipment provide inspection and maintenance information in the operating manuals and specific SOPs address additional procedures for testing equipment. Table 10-1 below provides a list of current SOPs related to the criteria pollutant ambient air monitoring program.

Consistency in sampling and analysis operations requires the use of SOPs. SOPs are written documents that detail the method for an operation, analysis, or action with thoroughly prescribed techniques and steps, and are officially approved as the method for performing certain routine or repetitive tasks. SOPs ensure consistent conformance with MPCA practices, serve as training aids, provide ready reference and documentation of proper procedures, reduce work effort, and reduce error occurrences in data, and improve data comparability, credibility, and defensibility. They must be written clearly in a step-by-step format to be readily understood by a person knowledgeable in the general concept of the procedure. Elements included in SOPs are:

1. Scope and Applicability
2. Summary of Method
3. Definitions
4. Health and Safety Warnings
5. Cautions
6. Interferences
7. Personnel Qualifications
8. Apparatus and Materials
9. Instrument or Method Calibration
10. Sample Collection
11. Handling and Preservation Sample Preparation and Analysis
12. Troubleshooting
13. Data Acquisition, Calculations & Data Reduction
14. Computer Hardware & Software (used to manipulate analytical results and report data)
15. Data Management and Records Management

SOPs should follow the guidance document Guidance for the Preparation of Standard Operating Procedures EPA QA/G-6[xiii].

Table 10-1: MPCA ambient air monitoring network SOPs.

Subject/Pollutant(s) Covered	SOP Title	Version/Date
CO	Standard Operating Procedure for Ambient Air Carbon Monoxide Monitoring, Environmental Data Quality Unit	Revision 2013-1/April 1, 2013
Data Validation	Standard Operational Procedures for	Revision 2013-2/August 2013

	Data Validation and Data Editing of Air Monitoring Instruments Using Agilaire's AirVision Editor	
LIMS	StarLIMS Standard Operational Procedures, Air Monitoring Unit	Version 1.4/July 2002 (replacement is under way)
NO_2	Standard Operating Procedure for Ambient Air Nitrogen Dioxide Monitoring, Environmental Data Quality Unit	Revision 2013/May 2, 2013
O_3	Standard Operating Procedure for Ambient Air Ozone Monitoring, Environmental Data Quality Unit	Revision 2013/June 22, 2013
PM_{10}	Minnesota Pollution Control Agency Standard Operational Procedures for Auditing Volumetric Flow Controlled PM Monitors, Air Monitoring Unit	Revision 5/ August 14, 2017
PM_{10}/TSP	PM_{10}/TSP Particulate Matter Standard Operational Procedure for Volumetric-Flow-Control (VFC) System	Revision 5/ August 14, 2017
SO_2	Standard Operating Procedure for Ambient Air Sulfur Dioxide Monitoring, Environmental Data Quality Unit	Revision 2/April 9, 2013
Lead	TSP/ICP Filter Strip Extraction, Air Monitoring Unit	Revision 5/ August 14, 2017

10.1 Analyzers

Except for the specific exceptions described in Appendix C of 40 CFR Part 58, monitoring methods used for SLAMS monitoring must be a reference or equivalent method, designated as such by the 40 CFR Part 53.23. Among reference and equivalent methods, a variety of analyzer designs and features are available. For some pollutants, analyzers employing different measurement principles are available, and some analyzer models provide a higher level of performance than others that may only meet the minimum performance specifications Accordingly, in selecting a designated method for a particular monitoring application, the MPCA places consideration to such aspects as:

- the suitability of the measurement principle
- analyzer sensitivity
- susceptibility to interferences that may be present at the monitoring site
- requirements for support gases or other equipment
- reliability
- maintenance requirements
- initial as well as operating costs
- features such as internal or fully automatic zero and span checking or adjustment capability, etc.

It is important that the purchase order for a new reference or equivalent analyzer specify the designation by the EPA and document the required performance specifications, terms of the warranty, time limits for delivery and for acceptance testing.

Upon receiving the new analyzer, the MPCA staff carefully read the instruction or operating manual provided by the manufacturer of the analyzer. Following analyzer assembly, an initial calibration is performed to verify that the instrument is operational and performing to specifications of test procedures provided in 40 CFR Part 53. These tests include response time, noise, short-term span and zero drift, and precision. If an analyzer falls short of the requirements, the analyzer is returned to the manufacturer with an explanation of rejection.

10.2 Analyzer logbook

Each analyzer in the MPCA ambient monitoring network has its own logbook. Information related specifically to an analyzer identified by serial number is recorded, signed, and dated in either blue or black ink. The information recorded follows the analyzer and is a valuable tool for troubleshooting and understanding the analyzer history. The information that belongs in the station log includes the following:

- Date/Time at beginning and end of analyzer activity
- Initials of person(s) at the site
- Activity detail including results (e.g. calibration results, precision/span results, repairs made, preventative maintenance)
- Document relocation/shipment

10.3 Support instrumentation

Experience of the MPCA staff plays the major role in the selection of support equipment. Preventive maintenance, ease of maintenance, and general reliability play a crucial role in the selection of support equipment. The following examples show some support equipment and some typical features to look for when selecting this equipment.

Dilution Calibration Standards: Calibration standards are normally two types: Mass Flow controlled (MFC) or permeation devices. The MPCA utilizes both types for specific applications.
Data Acquisition Systems (DAS): The MPCA has elected to use ESC data loggers which have 16 bit logic, modem capabilities, allow remote access and control and are able to initiate automated zero, span, and precision checks.
Analog Chart Recorders: Chart recorders are required on all MPCA continuous monitors. They may must accept multi-voltage inputs (i.e, be able to accept 1, 5 or 10 volt inputs)
Zero Air Systems: Zero air systems should be able to deliver 10 liters/min of air that is free of contaminants, be free of O_3, NO, NO_2, SO_2 to 0.001 ppm and CO and Hydrocarbons to 0.1 ppm.

10.4 Laboratory support

The MPCA has full laboratory facilities. These facilities are equipped with all equipment necessary to test, repair, troubleshoot and calibrate all analyzers and support equipment needed to operate the Ambient Air Criteria Monitoring Program.

The laboratory is designed to accommodate the air quality lab/shop, a PM_{10} filter room, and QA support activities. One bench and rack are dedicated to ozone traceability. Other instrument benches are designated for calibration and repair. Several cabinets set aside to house spare parts and extra analyzers. For ambient air samples to provide useful information or evidence, laboratory analyses must meet the following four basic requirements:

i. Equipment must be frequently and properly calibrated and maintained (Section 11).
ii. Personnel must be qualified to make the analysis (Section 6).
iii. Analytical procedures must be in accordance with accepted practice (Section 10)
iv. Complete and accurate records must be kept (Section 13 & 17).

For the Ambient Air Criteria Monitoring Program, laboratory activities are mainly focused on the pollutants associated with manual measurements; basically lead and particulate matter.

10.5 Preventive maintenance

Maintaining the equipment within the MPCA network is vital to prevention of downtime and costly repairs. Preventive maintenance is an ongoing portion of quality control. Since this is an ongoing process, it is included in the daily routines of the field operators. In addition to the daily routines, there are monthly, quarterly, semi-annually, and annually scheduled activities that must be performed. Preventive maintenance is primarily the responsibility of the field operators and the technical staff. It is important that the Quality Assurance coordinator reviews the preventive maintenance work, and continually checks the schedule. The Air Unit Supervisor is responsible for making sure that the preventive maintenance is being accomplished in a timely manner.

Each piece of equipment (analyzers and support equipment) has a bound notebook that contains all preventive maintenance and repair data for that particular instrument. This notebook should stay with the instrument wherever it travels. In addition, the LIMS system has the capability to record all maintenance activities for each instrument.

The preventive maintenance schedule is changed whenever an activity is moved or is completed and repairs must be followed by calibrations or verifications. On a regular basis, the Air Unit Supervisor should review the preventive maintenance schedule with the field operators.

10.6 Site maintenance

Site maintenance is a portion of preventive maintenance that does not occur on a routine basis. These tasks usually occur on an "as needed" basis. The station maintenance items are checked whenever an agency knows that the maintenance needs to be performed. Examples of some station maintenance items include:

- floor cleaning
- shelter inspection
- air conditioner repair
- AC filter replacement
- weed abatement
- roof repair
- general cleaning

10.7 Site log

The site log is a chronology of the events that occur at each monitoring station. The log is an important part of the equation because it contains the narrative of problems and solutions to problems. The site log notes should be written in a narrative rather than technical details. The technical details belong in the instrumentation log. The items that belong in the station log are:

- the date, time, and initials of the person(s) who have arrived at the site
- brief description of the weather (i.e., clear, breezy, sunny, raining)
- brief description of exterior of the site. Any changes that might affect the data, for instance, if someone is parking a truck or tractor near the site, this may explain high NO_x values, etc.
- any unusual noises, vibrations or anything out of the ordinary
- description of the work accomplished at the site (i.e., calibrated instruments, repaired analyzer)
- detailed information about the instruments that may be needed for repairs or troubleshooting

10.8 Routine operations

Routine operations are the checks that occur at specified periods of time during a monitoring station visit. The duties are the routine day-to-day operations that must be performed in order to operate a monitoring network at optimal levels. Some typical routine operations are detailed in Table 10-1.

Table 10-2: Routine Operations

Item	Each visit	Bi-Weekly	Monthly
Mark Strip Charts	X		
Change Inlet Filters.			X
Check electrical connections	X		
Inspect manifold and probe		X	
Check Exterior	X		
Record Site Log	X		
Inspect tubing	X		
Check Desiccant			X
Inspect Compressed Gas Cylinders		X	

In addition to these items, meteorological instruments and tower, entry door, electrical cables and any other items deemed necessary to check should be inspected for wear, corrosion and weathering.

10.9 Supplies and Consumables

Control of supplies and consumables is important to the success of the quality assurance program. An adequate supply of consumables such as strip charts, recorder pens, inlet filters spare parts and sample filters is essential to uptime and data quality. The air monitoring Unit will maintain at least a six month supply of all consumable supplies.

10.10 Supplies management

Currently, the MPCA maintains a supply of consumable products within the Air Laboratory
Field operators and laboratory staff maintain this stock on an as needed basis. Purchasing of supplies is done by several individuals including the field coordinator, quality assurance officer, Laboratory Operations Coordinator, Instrument calibrator, with the Air Monitoring Unit Supervisor responsible for all supply purchases. The laboratory manager ensures that a six-month stock of consumables is constantly maintained.

10.11 Gas standards

There are two types of calibration gas standards utilized at the MPCA, compressed gas cylinders and permeation tubes. The inventory of compressed gas standards is tracked with the use of the LIMS system. This system allows easy access to MPCA staff as to the number of cylinders on hand, the concentration, pollutant, the type of standards available, and the certification status of each cylinder. Permeation tubes are not tracked by the LIMS system are used in onsite calibrators which are calibrated relative to a secondary transfer standard.

10.12 Sample filters

Sample filters (PM_{10}, TSP) are supplied though the national contract managed by the U.S. EPA. The MPCA makes estimates of filter consumption on a yearly basis and request that number though Region 5. All filters are inspected prior to use for defects or pin holes with a light box.

10.13 Beta Attenuation Tapes (BAM)

The MPCA will maintain a supply of BAM paper tapes purchased from the manufacture adequate to support the network for at least three months. These tapes will be stored in the factory sealed packaging as directed by the manufacture's specifications.

11.0 Instrument Calibration and Frequency

Calibration of an instrument must occur prior to any sampling or analysis. Calibration of an analyzer establishes the quantitative relationship between actual pollutant concentration input and the analyzer's response. Each analyzer should be calibrated as directed by the analyzer's operation or instruction manual and in accordance with the general guidance provided here.

Calibrations should be carried out at the field monitoring site by allowing the analyzer to sample test gas streams containing known pollutant concentrations. The analyzer to be calibrated should be in operation for at least several hours (preferably overnight) prior to the calibration so that it is fully warmed up and its operation has stabilized. During the calibration, the analyzer should be operating in its normal sampling mode, and it should sample the test gas streams through all filters, scrubbers, conditioners, and other components used during normal ambient sampling and through as much of the ambient air inlet system as is practicable. All operational adjustments to the analyzer should be completed prior to the calibration. Analyzers that will be used on more than one range or that have auto-ranging capability should be calibrated separately on each applicable range.
Calibration documentation should be maintained within each analyzer's log book and also in LIMS. Documentation must include calibration response data, calibration regression equation, analyzer identification, calibration date, analyzer site location, calibration standards used and identification of calibration equipment used, and the person conducting the calibration.

11.1 Calibration standards

Ambient monitoring instruments should be calibrated by allowing the instrument to sample and analyze test atmospheres of known concentrations of the appropriate pollutant in air. All such (non-zero) MPCA test concentrations must be, or be derived from working standards (e.g., cylinders of compressed gas or permeation devices) that are certified as traceable to a NIST primary standard. "Traceable" is defined in 40 CFR Parts 50 and 58 as meaning "standard has been compared and certified, either directly or via not more than one intermediate standard, to a primary standard such as a National Institute of Standards and Technology Standard Reference Material (NIST SRM) or a USEPA/NIST approved Certified Reference Material (CRM)". Normally, the working standard should be certified directly to the NIST SRM or CRM, with an intermediate standard used only when necessary. Direct use of a CRM as a working standard is acceptable, but direct use of an NIST SRM as a working standard is discouraged because of the limited supply and expense of NIST SRM's. Certification of the working standard may be established by either the supplier or the user of the standard; Table 11-1 provides a summary of certification frequencies and criteria.

Table 11-1: Equipment certification criteria

Calibrator Certification	Frequency	Acceptance Criteria
Level 2 (Local Primary)	Annually vs EPA R5 SRP	Regression slope: 1.00 ±0.01 and intercept <1ppb
Level 3 (Ozone transfer standard)	1/6 months vs Level 2	Relative standard deviation of six slopes <3.7%; Std Dev of 6 intercepts 1.0; new slope within 0.05 of previous
Thermometer	Annually	0.1°C resolution, 0.5°C accuracy
Flow rate transfer standard	Annually	2.1% NIST traceable standard
Gas dilution system	Annually	Accuracy ±2.1% average (minimum 5

		points)
Gaseous standards	Refer to EPA Traceability Protocol for Gaseous Calibration Standards Table 2-3: Maximum Certification Periods for Calibration Standards in Passivated Aluminum Cylinders for concentration ranges and required recertification periods.	

At a minimum, the certification procedure for a working standard should:

- establish the concentration of the working standard relative to the primary standard
- certify that the primary standard (and the working standard) is traceable to an NIST primary standard
- include a test of the stability of the working standard over several days
- specify a recertification interval for the working standard

Test concentrations of ozone must be traceable to a primary standard UV photometer as described in 40 CFR Part 50 Appendix D.

Test concentrations at zero concentration are considered valid standards. Although zero standards are not required to be traceable to a primary standard, care should be exercised to ensure that zero standards are indeed adequately free of all substances likely to cause a detectable response from the analyzer. Periodically, several different and independent sources of zero standards should be compared; for example this may be completed by comparing zero response on different instruments using the same zero standard or by comparing an individual instrument response using two different zero standards.

The accuracy of flow measurements is critically important in many calibration procedures. Flow or volume measuring instruments should be calibrated and certified every year against NIST or other authoritative standards such as a traceable bubble flow meter or gas meter. Flow rate verifications, calibrations, acceptance criteria, methods, and frequencies are discussed in individual methods found in the *EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Part II.*

11.2 Multi-point calibrations

Multi-point calibrations consist of five or more test concentrations, including zero concentration, a concentration between 80% and 90% of the full scale range of the analyzer under calibration, and three or more intermediate concentrations spaced approximately equally over the scale range. Multi-point calibrations are used to establish or verify the linearity of analyzers upon initial installation, after major repairs and at specified frequencies. Most modern analyzers have a linear or very nearly linear response with concentration. If a non-linear analyzer is being calibrated, additional calibration points should be included to adequately define the calibration relationship, which should be a smooth curve.

Multi-point calibrations are likely to be more accurate than three point calibrations because of the averaging effect of the multiple points and because an error in the generation of a test concentration (or in recording the analyzer's response) is more likely to be noticed as a point that is inconsistent with the others. For this reason, calibration points should be evaluated statistically as they are obtained so that any deviant points can be investigated or repeated immediately.

Most analyzers have zero and span adjustment controls, which should be adjusted based on the zero and highest test concentrations, respectively, to provide the desired scale range within the analyzer's specifications. For analyzers in routine operation, unadjusted analyzer zero and precision response readings should be obtained prior to making any zero or span adjustments. $NO/NO_2/NO_x$ analyzers may not have individual zero and span controls for each channel; the analyzer's instruction manual should be consulted for the proper zero and span adjustment procedure. Zero and span controls often interact with each other, so the adjustments may have to be repeated several times to obtain the desired final adjustments.

The final, post-adjusted analyzer response readings should be obtained from the same device (chart recorder, data acquisition system, etc.) that will be used for subsequent ambient measurements. The analyzer readings are plotted against the respective test concentrations, and the best linear (or nonlinear if appropriate) curve to fit the points is determined. The MPCA LIMS system utilizes a least squares regression analysis to determine the slope and intercept for the best fit calibration line of the form:

$$y = mx + a$$

y represents the analyzer response
x represents the pollutant concentration
m is the slope
a is the x-axis intercept of the best fit calibration line, along with the correlation coefficient.

When this calibration relationship is subsequently used to compute concentration measurements (x) from analyzer response readings (y), the formula is transposed to the form:

$$x = (y - a)/m.$$

11.3 Level 1 zero and span calibration or check

As with any calibration or check, the analyzer should be operating in its normal sampling mode, and the test concentrations should pass through the inlet filter. For NO_2, SO_2, and particularly for O_3, wet or dirty inlet lines and particulate filters can cause changes in the pollutant concentration. A level 1 zero and span calibration or check is a simplified, two-point analyzer calibration or check used when analyzer linearity does not need to be checked or verified as with a multi-point calibration. These are completed every 2 weeks.

When no adjustments are made to the analyzer, the level 1 calibration may be called a zero/span check. Since most analyzers have a reliably linear or near-linear output response with concentration, their calibration can be adequately checked with only two concentrations points. Furthermore, one of the standards may be zero concentration, therefore, only one certified concentration standard is needed for the two-point (level 1) zero and span calibration. Although lacking the advantages of the multi-point calibration, the two-point zero and span calibration can be carried out much more frequently. Also, two-point calibrations are easily automated for ozone. Frequent checks or updating of the relationship with a 2-point zero and span calibration improves the quality of the monitoring data by helping to keep the relationship more closely matched to any drift in the analyzer response.

All zero and span measurements obtained from an analyzer must be calculated or adjusted on the basis of the most recent multipoint calibration. Almost all ambient monitoring instruments have physical means by which to make zero and span adjustments. These adjustments are used to periodically adjust the instrument's response to correct for calibration drift. *Note: $NO/NO_2/NO_x$ analyzers may not have* *individual zero and span controls for each channel. If that is the case, the zero and span controls must be adjusted only under the conditions specified in the calibration procedure provided in the analyzer's operation/instruction manual.*

Precise adjustment of the zero and span controls may not be possible because of:

1. limited resolution of the controls,
2. interaction between the zero and span controls,
3. possible delayed reaction to adjustment or a substantial stabilization period after adjustments are made.

Accordingly, significant zero and span adjustments (>5% of scale) must always be followed by a calibration. Allow sufficient time between the adjustments and the calibration for the analyzer to fully stabilize. This stabilization time may be substantial for some analyzers. Also, obtain unadjusted response readings before adjustments are made, as described in the previous section on level 1 zero and span calibration.

Zero and span adjustments do not necessarily need to be made at each calibration check. In fact, where only relatively small adjustments would be made, it is probably more accurate not to make the adjustments because of the difficulty of making precise adjustments mentioned earlier. The general rule of thumb followed by the MPCA is:
If multiple small adjustments have been made in sequential level 1 calibrations, then a multi-point calibration should be completed. Do not adjust if the drift is less than 2% of scale or more than 5% of scale. If the drift is greater than 5% of scale the monitor should be recalibrated.

11.4 Frequency of calibrations

Table 11-2 provides a summary of the frequency and acceptance criteria for calibrations in the MPCA network.

Table 11-2: Calibration requirements and frequencies

Instrument or Equipment	Calibration Item	Frequency	Acceptance Criteria
Gas dilution system	Flow controller	1/year	±2.1% of true flow
O_3 analyzer	Multi- point calibration	1/2 months during ozone season	All points within 2.1% of best fit straight line. Linearity error <5%
	Calibration check One Point QC	Minimum every 2 weeks	Within 7.1% of the most recent multi-point calibration set point
CO analyzer	Multi-point calibration	1/3 months	All points within 2.1% full of best fit straight line (0 and four upscale points)
	Calibration check One Point QC	Minimum every 2 weeks	Within 10.1% of the most recent multi-point calibration set point
SO_2	Multi-point calibration	1/3 months	All points within 2.1% full scale of best fit straight line (0 and four upscale points)
	Calibration check One Point QC	Minimum every 2 weeks	Within 10.1% of the most recent multi-point calibration set point

NO_2 analyzer	Multi-point calibration	1/3 months	All points within 2.1% of full scale of best fit straight line (0 and four upscale points)
	Calibration check One Point QC	Minimum every 2 weeks	Within 10.1% of the most recent multi-point calibration set point
	Converter efficiency	During multipoint calibrations, span, audit and once every 2 weeks	≥ 96%
PM_{10} sampler	System leak check	1 every month or pre-calibration	Leak rate of <2.0 lpm
	Multipoint flow calibration	Every 2 months or as needed	10.1% of design (multipoint, 3 points)
	1 point flow check	1 every month	4.1% of expected flow

Additionally, multi-point (5 point) calibrations will be performed on each ambient monitoring instrument on each of the following occasions:

- upon initial installation
- following physical relocation
- after any repairs or service that might affect its calibration
- following an interruption in operation of more than a few days
- upon any indication of analyzer malfunction or change in calibration
- at the regular scheduled time interval (see below)

11.5 Validation of ambient data based on calibration information

When zero or span drift validation limits (see table 11-3) are exceeded, ambient measurements should be invalidated back to the most recent point in time where such measurements are known to be valid. Usually this point is the previous calibration zero/span check or accuracy audit, unless some other point in time can be identified and related to the probable cause of the excessive drift (such as a power failure or malfunction). Also, data following an analyzer malfunction or period of non-operation should be regarded as invalid until the next subsequent (level 1) calibration unless unadjusted zero and span readings at that calibration can support its validity.

Table 11-3: Zero or span drift validation limits

Parameter	Zero/Span Drift Reject
Sulfur Dioxide	Zero Drift: 24-hour: >3.1 ppb 14-day: >5.1 ppb Span Drift: >10 .1% of value
Ozone	Zero Drift: 24-hour: >3.000 ppb 14-day: >5.000ppb

	Span Drift: >7 % of value
Nitrogen Oxides	Zero Drift: 24-hour: >3.1 ppb 14-day: >5.1ppb Span Drift: >10.1 % of value
Carbon Monoxide	Zero Drift: 24-hour: >0.4 ppm 14-day: >0.6 ppm Span Drift: >10.1% of value

12.0 Data Acquisition and Information Management

All ambient air monitoring data will eventually be transferred and stored in AQS. As stated in 40 CFR Part 58, the MPCA shall report all criteria pollutant data and information specified by the *AQS Users Guide (Version 1.0.0, July 31, 2013)* in the pipe-delimited AQS Format. The following sections provide information on how MPCA's air monitoring program meets these requirements.

12.1 Equipment

Most of the continuous data is collected through automated systems directly from the monitoring sites. The MPCA utilizes ECS Model 8832 data loggers as the primary data acquisition system. These units have a running speed of 50 MHz, 32MB of DRAM for operational data and code execution, and 2MB of SRAM for data and configuration storage, Ethernet port, power fail detect and battery backup for RAM and real time clock. Data are transmitted back to the MPCA office via cellular modem and temporarily stored in a PC based data acquisition system called AirVision from Agilaire Inc.

12.2 LIMS data entry/formatting

The data are validated at this point with ESC software applications. The validated data are transferred over the LIMS system where additional editing is possible. Here the data are converted into AQS format. Backup and recovery procedures are in place and incorporated into the data acquisition SOP. All collected data are backed up daily on an agency server. Manual data entry can be performed at either point in the data collection process, that is, data may be entered at the ECS work station or directly into the LIMS system.

12.3 Raw data

Raw data are worksheets, records, memoranda, site logs, or exact copies that are the result of original observations and activities of a study and are necessary for the reconstruction and evaluation of collected data. Raw data may include photographs, microfilm or microfiche copies, computer printouts, magnetic media, recorded data from automated instruments and strip charts. The MPCA stores raw data by date, in file cabinets arranged by site number and pollutant.

12.4 Records and archive

All raw data, documentation and records will be retained for an appropriate period of time. Correspondence and other documentation relating to interpretation and evaluation of data collected, analyzed, processed or maintained on automated data collection systems will also be retained. Other records to be maintained include but are not limited to:

- software and/or hardware up grades
- editing records/tracking
- hardware maintenance records
- records of problems and corrective actions
- records of backups and recoveries

Further detail on records retention can be found in Section 17.

12.5 Environmental Systems Corporation (ESC) data system controller

The initialization of the ESC logging and reporting system consists of an operator programming parameters so that the voltages produced by the instruments can be read, scaled correctly and reported in the correct units. The instruction for initialization is included in the ECS manual and SOP. Using the ESC data system controller, data from multiple analyzers at one site are logged and later transferred to the MPCAs data validation software, AirVision.

12.6 Standard forms for reporting

AirVision is designed to maintain compatibility with AQS reporting. The same station codes and error codes are used by both programs. Whenever station parameters change or when a station is moved, updated site identification information is submitted to the AQS and is also updated in AirVision.

12.7 ESC data acquisition quality control

Since, the use of the ESC data logging device for automated data handling from a continuous analyzer is not a guarantee against recording errors. Internal validity checks are necessary to avoid serious data recording errors. These measures are used to prevent or lessen the possibility of acquisition errors.

1. Verification- The verification of an ESC is performed yearly following manufacturers recommendations. This is achieved by inputting known voltages into the ESC and measuring the output of the ESC. This is achieved by connecting the ESC to a MetOne BAM and adjusting the BAM volt ranges to 0, 0.5 and 1. The voltage output of the MetOne BAM is checked using a Fluke voltmeter which verifies the output and the ESC reading. This method can be completed using other monitoring instruments as well; the DAS owner's manual should be followed.
2. Performance Audit- The performance audit consists of challenging the instrument and ESC to a known audit source gas and observing the final response. The response on the monitor being tested should correspond to the value displayed for the monitor on the ESC.
3. Strip Chart Comparison- consists of comparing a value or values collected by the DAS to the corresponding time and date on the instrument strip chart.

12.8 ESC data transfer

The monitoring instruments produce an analog voltage that is collected by an ESC and averaged for one minute over the course of an hour to produce an hourly average. These hourly averages are stored by the ESC and transmitted to AirVision via an automated retrieval system which retrieves data every hour. Depending on the timeframe of data averages (e.g. hourly, minute, or 5-minute), raw analyzer data is stored internally for up to a month on the ESC data logger. In addition to the electronic collected data, the analog output of the analyzers is recorded on chart recorders. This serves as a back-up system in case of ESC failure. Newer analyzers utilize the Modbus protocol for digital data collection via an Ethernet connection.

12.9 ESC data review

The data review is an ongoing process that is performed by the field operators, the field coordinator, the quality assurance coordinator, and the quality assurance specialist. The data review process includes reviews of the daily zero, span and precision reports, calibration information, hourly data flags, recording any information on the daily site logs that might be vital to proper reviewing of the data strip charts, and verifying the data flags against LIMS entries, field log books, site logbooks, and operator forms.

12.10 The Air Quality System (AQS) database

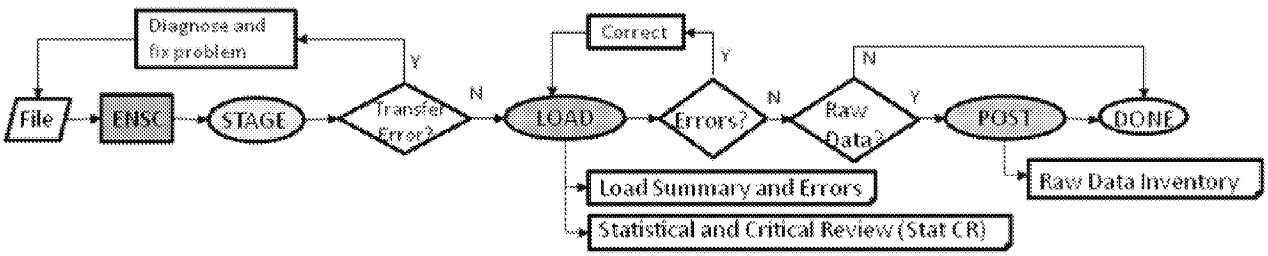
Ambient air quality criteria pollutant data are required is to reside in the AQS database. Information on the AQS is described in various manuals and guides listed at
http://www.epa.gov/ttn/airs/airsaqs/manuals/
Recommended procedures for coding, key punching, and data editing are described in various sections of these user manuals.

The AQS users are responsible for the following steps in the data submittal and data update process:

Exchange Network Services Center (ENSC) is the only way to move data files from any organization to AQS and is the first step in any batch data submission. AQS connection service will need to be added the first time ENSC is used; the AQS Submit Screen in ENSC contains several fields that need to be filled in addition to uploading your batch file.
STAGE process which details converting data from submitted format to AQS database format
LOAD transfers transactions into a screening file.
CORRECT alters, removes, or creates transactions in the screening file in order to fix errors identified in the EDIT.
POST incorporates data into summaries and makes data public.

Statistical and critical review reports are generated by the load process and contain information about irregularities in the process data. The findings are not errors but provide a list of the monitor, date/time, and the problem with any data values. Figure 12-1 below shows the data processing flow.

Figure 12-1: AQS data process flow.



b. Processing of Quality Assurance Information

All precision and accuracy assessment readings from MPCA analyzers are processed as manual entries into LIMS. The LIMS data processing system does include provisions for handling precision and accuracy data and can fulfill the AQS transactions required.

c. Non-Programmed Adjustments to Ambient Data

In general, the MPCA discourages after-the-fact adjustments or "corrections" to ambient data. Occasionally, based on unanticipated events or discoveries this may be the only option available to save a large data set. Before any changes would be made to ambient criteria data, potential changes would be discussed with the appropriate EPA Region V Official.

If, after scrutiny, a special, non-programmed adjustment is determined to be appropriate and is made to a block of ambient data, it would be very important to ensure that the exact same adjustment is also made to any QA data (precision and accuracy measurements) obtained during the affected time period. Any data quality calculations affected by the change should also be recomputed. All such adjustments should be completely documented, including the rationale and justification for the adjustment, with applicable data qualifiers associated detailed in AQS.

13.0 Data Review, Verification and Validation

Data review, verification and validation are techniques used by the Quality Assurance Coordinator to accept, reject or qualify data in an objective and consistent manner. Verification can be defined as confirmation by examination of objective evidence that specified data requirements have been fulfilled. Validation can be defined as examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled

13.1 Verification / Validation

Each of the following areas will be considered during the data verification/validation process:

Sampling Design - That the measurement represents the actual environment (spatial and temporal); fully meeting all siting criteria.
Quality Control - QC checks that are to be performed during sample collection and are found to be within acceptance criteria.
Calibration - Calibration of instruments and equipment were performed within an acceptable time prior to generation of measurement data
Comparability - Comparable monitors provide data which are consistent and that collocated sampler measurements produce data that meets the stated precision intervals.
Corrective Action Requests – A review of all corrective action forms will be included as part of the validation process to address any possible data impacts.

The data verification process involves the inspection, analysis, and acceptance of the field data or samples. These inspections can take the form of technical systems audits (internal or external) or frequent inspections by field operators and lab technicians.

Data validation is a routine process designed to ensure that reported values meet the quality goals of the environmental data operations. Quality control data is a vital aspect of the data validation process. If QC data assessment results clearly indicate a serious response problem with the analyzer, the MPCA will invalidate the data set. When precision, bias, or accuracy assessment readings are obtained during any period for which the ambient readings immediately before or after these readings are determined to be invalid, the precision, bias, and accuracy readings should also be invalidated. The basis or justification for all data invalidations must be permanently documented.

13.2 Data Review Methods

Review of the raw data allows for the detection of possible data errors and questionable data values. Zero/span drift or inexplicable cyclic response may be indications of suspect data. Using statistical plots based on time of day, time of week or month to examine the data or other graphical representations may reveal these types of errors. The MPCA utilizes the AirVision data validation software for much of this process; this software houses data collected from ESC data loggers and includes data flags. Review of data occurs in various levels as follows:

Level 0 is performed by LIMS and the ESC data logger which flags data for the following:

- Times that the instrument was down due to calibration, repair or auditing activity
- Data over the warning and acceptance limits
- Hourly data containing less than 45 minutes

- Negative values
- Exceedances to typical maximum ambient values
- Flow Rate (average rate, CV)

Level I is performed by field operators

- Meteorology sensor checks
- Maintenance Sheet checks and observations
- Filling out analyzer logs
- Review telemetry data
- Instrument zeroing
- Shelter temperature checks
- Event observations

Level II is performed by the quality assurance staff

- Review chart data, identify extreme values and outliers, constant values, block of zeros or missing values and investigate the validity of values
- Invalidating data that are outside acceptable criteria
- Adjust or invalidate data if NO + NO_2 > NO_X
- Check for consistency with season, week, day, hour

Level III is performed by the data analysis staff as needed

- Compare pollutant data to meteorology (wind direction, wind speed)
- Compare data from nearby sites

Quality assurance staff reviews graphs of the linear data and data from the chart recorder when the data is suspect. Anomalies or indications of systematic issues (low completeness, unusual data points, etc.) are reported to management.

Once all the edits on the data in the central database are completed, an AQS formatted data file is generated the Information Management for submittal to EPA-AQS. A Scan Report is run on AQS and reviewed by Information Management staff to identify values that exceed the historical maximum readings in AQS for investigation. If data are found to be invalid or need editing, the changes are done in AQS. The AQS database documents these changes in a log which states the time period for the data in question, the action taken and the reason for the edit.

14.0 Assessment and Corrective Action

Assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation, management systems review, peer review and inspection. Corrective action is a function performed in the event of a machine malfunction, threat to site integrity including safety, or deviations from SOPs or this QAPP.

14.1 Network Reviews

Compliance with network requirements of the Ambient Air Monitoring Network described in 40 CFR 58 Appendices D and E is determined through annual network reviews of the ambient air quality monitoring system. The annual review of the network is used to determine how well the network is achieving its required monitoring objectives and how it should be modified to continue to meet its objectives. The MPCA is also subject to network reviews conducted by the EPA Region V Office.

14.2 Performance Evaluations

Performance evaluations are a means of independently verifying and evaluating the quality of data from a measurement phase or the overall measurement system. This is accomplished through the use of samples of known composition and concentration or devices that produce a known effect. These samples can be introduced into the measurement system as single blind (identity is known but concentration is not) or double blind (concentration and identity unknown). These samples can be used to control and evaluate bias, accuracy and precision and to determine whether DQOs or MQOs have been satisfied. Performance evaluations can also be used to determine inter- and intra-laboratory variability and temporal variability over long projects. The MPCA accomplishes the quality objectives of performance evaluations though participation in the National Performance Audit Program described below.

14.2.1 National Performance Audit Program

The National Performance Audit Program (NPAP) is a cooperative effort among OAQPS, the 10 EPA Regional Offices, and the 170 state and local agencies that operate the SLAMS/NAMS/PAMS/PSD air pollution monitors. Also included in the NPAP are approximately 135 organizations (governmental and private) that operate air monitors at PSD sites. Participation in the NPAP is required for agencies operating SLAMS/NAMS/PAMS/PSD monitors as per Section 2.4 of 40 CFR Part 58, Appendix A and Section 2.4 of 40 CFR Part 58, Appendix B.

The goal of the NPAP is to provide audit materials and devices that will enable EPA to assess the proficiency of agencies that are operating monitors in the SLAMS/NAMS/PAMS/PSD networks. To accomplish this, the NPAP has established acceptable limits or performance criteria, based on the data quality needs of the SLAMS/NAMS/PAMS/PSD requirements, for each of the audit materials and devices used in the NPAP.

All audit devices and materials used in the NPAP are certified as to their true value, and that certification is traceable to a NIST standard material or device wherever possible. The audit materials used in the NPAP are as representative and comparable as possible to the calibration materials and actual air samples used and/or collected in the SLAMS/NAMS/PAMS/PSD networks. The audit material/gas cylinder ranges used in the NPAP are specified in the Federal Register.

The MPCA participates in the NPAP audits by coordinating with EPA contractors to provide site access and information as needed for completion of an audit. Audit systems are used to generate pollutant concentrations and flowing air streams which are introduced into operational monitors in the field by EPA contractors. The pollutant concentrations and air stream flow rate are unknown to the MPCA at the time of the audit. The results from the use of the audit systems are recorded on a data form, returned to EPA, and compared to the concentration or flow rate that should have been generated by the audit system under the environmental conditions at the site. The differences between the EPA expected (certified) values and the MPCA's reported values are calculated and returned for evaluation. Table 14-1 lists the acceptance criteria for the audit material.

Table 14-1: NPAP Acceptance Criteria

Audit	EPA determined limits
O_3	Audit levels 1&2 ±1.5 ppb difference, all other levels percent difference ±10.1%
SO_2 , NO_2	Audit levels 1&2 ±1.5 ppb difference, all other levels percent difference ±15.1%
CO	Audit levels 1&2 + 0.03 ppm difference all other levels percent difference + 15.1%

14.3 MPCA Performance Audits

In addition to NPAP, the MPCA also conduct performance audits. Detailed information on the procedures for these audits can be found in the appropriate pollutant SOP. Any deficiencies will result in the issuance a Request for Corrective Action form.

14.4 Technical Systems Audits

A systems audit is an on-site review and inspection of the MPCA's ambient air monitoring program to assess its compliance with established regulations governing the collection, analysis, validation, and reporting of ambient air quality data. A systems audit of each state or autonomous agency within EPA Region V is performed every three years by a member of the Region V Quality Assurance staff.

Once the systems audit is complete the audit team members meet with key MPCA Air Monitoring personnel and present their findings. This is also the opportunity for the agency to present their disagreements if any. Within thirty (30) calendar days of the completion of the audit, the audit report should be prepared and submitted to the MPCA.

Any corrective actions and follow-up activities required by the audit are implemented and an audit response letter is generated by the MPCA and submitted to EPA Region V within 30 days of acceptance of the audit report.

14.5 Data Quality Assessments

A data quality assessment (DQA) is the statistical analysis of environmental data, to determine whether the quality of data is adequate to support the decisions upon which are based on the MQOs. OAQPS performs data quality assessments for the pollutants of the Ambient Air Monitoring Network at a yearly frequency for data reports and at a 3-year frequency for more interpretative reports. The MPCA constantly monitors the quality of all data reported in order ensure MQOs will be met.

15.0 Reconciliation with Data Quality Objectives

The reconciliation with the DQOs occurs using the data quality assessment process. Part of the process includes the review of the DQOs with the sampling design and network configuration to assure that the sampling design and data collection methods are consistent with the needs for the DQOs. This is initiated annually with the annual network plan development by the information manager in the Air Data Analysis Unit.

Since national requirements for monitoring may change as U.S. EPA or local monitoring needs develop, the annual network plan will reflect the sampling design to address those changes. A more thorough analysis is conducted through the 5 year network assessment where statistical tools are used to conduct station correlations, review of station objectives and scales, etc. for which analyses conclusions may affect the DQOs.

The reconciliation process with DQOs also involves a review of the MQOs through the QA verification as outlined in Section 15.0, if findings indicate that certain MQOs have not been met, then a review of the impacted measurements will be conducted and actions taken to improve the MQOs. MQOs involve reviewing both routine and QA/QC data to determine whether the MQOs have been attained and that the data is adequate for its intended use.

16.0 Documentation and Records Management

This section provides current practices for records development and retention for the MPCA Ambient Air Criteria Monitoring Program; this section will be updated as needed. The State of Minnesota has a structured record management retrieval system that allows for the efficient archive and retrieval of records. Table 16-1 represents the categories and types of records applicable to document control. Much of these files are located within the MPCA's internal network X:Drive, hyperlinks to these file locations have included where applicable; these documents are only accessible within the network.

Table 16-1: Reporting Information

Categories	Record/Document Types	Additional Information
Management and Organization	State Implementation Plan Reporting agency information Organizational structure Personnel qualifications and training Training Certification Quality management plan Document control plan Grant allocations Support Contract	 Personnel files Personnel files
Site Information	Network description Site maps Site Pictures	
Environmental Data Operations	QA Project Plans Standard operating procedures (SOPs) Field and laboratory notebooks Sample handling/custody records Inspection/Maintenance records	 QA Laboratory AQ Laboratory QA Laboratory
Raw Data	Any original data (routine and QC data) including data entry forms All strip charts	AQ Laboratory QA Laboratory
Data Reporting	Air quality index report Data/summary reports Journal articles/papers/presentations	
Data Management	Data algorithms Data management plans/flowcharts Validated Data Data Management Systems	
Quality Assurance	Network reviews Control charts Data quality assessments System audits Response/Corrective action reports Site Audits	

All records will be retained for 5 years from the date of generation. However, if any litigation, claim, negotiation, audit or other action involving the records has been started before the expiration of the 5-year period, the records must be retained until completion of the action and resolution of all issues which arise from it, or until the end of the regular 5-year period, whichever is later.

16.1 Project Records

The MPCA will establish and maintain procedures for the timely preparation, review, approval, issuance, use, control, revision and maintenance of documents and records. Tables 16-2 and 16-3 represent the categories and types of records associated with document control for criteria information.

Table 16-2: Laboratory Records

Document Name	Brief Description	Format	Location
Laboratory Notebooks	Includes the following: + Analysts' notebooks + Instrument maintenance logs + Materials acceptance tests	Hard Copy	Next to respective instruments in laboratory
Calibration certificates and records	Includes certificates of NIST traceability and similar records	Hard Copy	Posted in a visible location either next to or attached to each instrument
Control charts or equipment	Quality control information displayed in sequence to help diagnose problems with analytical instruments; includes acceptance limits that are periodically recomputed	Electronic/hard copy	On laboratory computer
SOPs/QAPPs/COC	Current copies of SOPs and QAPPs relevant to analyses performed in laboratory and COC forms from outstate sites	Electronic	X:Drive
Analytical results database	Results for each analysis with identifying information	LIMS	Analyst computer/LIMS
Analytical quality control database	Includes QC information for each weighing session including standard weights, duplicates, field blanks, and laboratory blanks	LIMS	Analyst computer/LIMS

Table 16-3: Station Records

Document Name	Brief Description	Format	Location
Station logbook	Logs station activity	Hard copy	Station
Instrument User's Manual and SOPs	Information for setting up, operating, and troubleshooting monitors	Hard copy	Station
Calibration certificates and records	Includes certificates for gases and other chemicals used for calibration	Computer files and hard copy	X:Drive
Raw data records	Results of instrument analyses (including supporting data that is not uploaded to the database)	LIMS, AirVision	LIMS, AirVision database/server

16.2 Management and Organization

Responsibilities for many of the document types listed in Table 16-1 can be found in the MPCA Quality Management Plan[xiv], which details how MPCA's quality management objectives will be attained.

16.3 Data Flow

Figure 16-1 details the sources of ambient air quality data and how the data is validated, tracked, and stored throughout MPCA databases which are further detailed in Section 16.4.

16.3 Databases

Various data systems are used to track and store raw and validated data, site details, inventory tracking, instrument calibration/maintenance, and quality assurance both in the field and in the laboratory. These programs are periodically updated via software upgrades; some program functions are custom built.

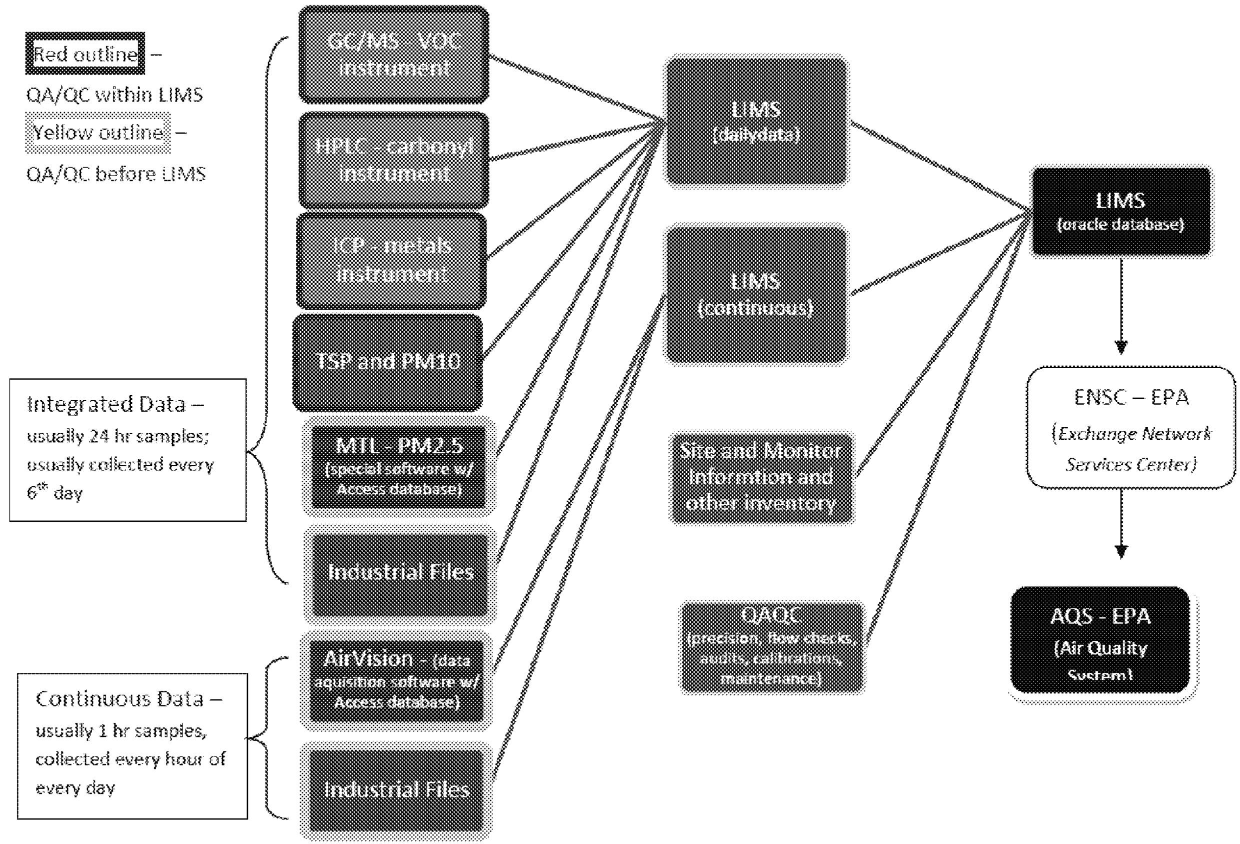
AirVision- AirVision is validation software utilized to retrieve, store, review, and validate ambient monitoring data. AirVision can be accessed by multiple users and is a back-up database for all continuous monitor raw data.

AQS- The AQS is EPA's repository for ambient air quality data. Within 90 days of the end of each quarter, MPCA reports all ambient air monitoring data directly to AQS via the internet. Invalidated data are reported with assigned null data codes. The MPCA also reports quarterly precision, bias, and accuracy data consistent with the data reporting requirements specified for air quality data as set forth in 40 CFR § 58.35(c).

LIMS- The Air Monitoring Unit uses a server-based Air Laboratory Information Management Systems (LIMS) database system to manage the high volume of data generated from all aspects of air monitoring, including data validation, storage, and retrieval. In addition, LIMS maintains all information regarding monitoring sites and support equipment.

OnBase- OnBase is the Agency's electronic document management system. The goal is to manage as many documents in electronic format as is feasible. This includes converting paper documents (via scanning) and managing electronic documents in their native format (e.g. Microsoft Word, Excel, PowerPoint, digital photos, etc.). The Environmental Data Quality Unit and Air Monitoring Unit are currently reviewing hardcopy data related to the criteria pollutant monitoring program to develop appropriate taxonomy's for archiving. This section will be updated to include taxonomy details once available.

Figure 16-1: MPCA ambient air quality data flow



Green –air toxics lab instruments; data files are imported into LIMS via specialized DCUs by lab staff; QAQC is done in LIMS

Red – other databases; QAQC is done quarterly before data goes into LIMS ($PM_{2.5}$ data are processed and stored in MTL software and database; continuous data are processed and stored in AirVision software and database)

Brown –data are entered directly into LIMS by AMU and QA staff; there is a direct connection to a balance in the lab for PM_{10} and TSP weights; QAQC is done in LIMS for TSP and PM_{10}

Purple – data files sent from facilities are stored in our database and transferred to AQS; QAQC is done mostly by facilities

Blue - Integrated data are in *DailyData* table (data from lab are in *Results* table until passing QAQC); continuous data are in *Continuous* and *Contdetails* tables

Black – data are transferred from LIMS to AQS via the Exchange Network Services Center (manual process with built in statistical checks)

16.4 Record Archiving

All raw data required for the calculation criteria pollutant concentration, submittals to the AQS database, and QA/QC data are collected electronically or on data forms that are included in the field and analytical methods sections. All hardcopy information will be filled out in indelible blue or black ink. Corrections will be made by inserting one line through the incorrect entry, initialing this correction, and placing the correct entry alongside the incorrect entry, if this can be accomplished legibly, or by providing the information on a new line. All hardcopy information will be filed and stored for a minimum of 5 years.

16.5 Notebooks

Analyzer and Station notebooks - Notebooks will be issued for each sampler and each station. These will be bound books that contain numbered pages. Appropriate data forms for routine operations as well as inspection and maintenance forms and SOPs are available in electronic format. Completed electronic field data forms will be stored within the MPCA LIMS system.

Lab Notebooks - Notebooks will also be issued for the laboratory. These notebooks will be uniquely numbered and associated with the Lead Program. The notebooks will be available for general comments/notes regarding calibration and routine operation of analytical instruments. QA/QC data as well as all sample information will be electronically stored within the LIMS system.

16.6 Electronic Data Collection

Automated ESC data logger systems are utilized where appropriate and record the hourly data from each continuous instrument. These data are then transmitted back to the Air Monitoring Unit for review and storage within the MPCA LIMS system. In order to provide a back-up, a strip chart hardcopy of the data from each instrument will be stored for the appropriate time frame in site files. The electronic data is also backed up on an Agency server. These systems are effectively managed by Minnesota IT Services and are documented by use of a set of guidelines provided by Minnesota IT Services, that ensure data integrity at all times.

16.7 Quality Assurance

Quality assurance information documenting data quality is also stored within the LIMS system. This information includes all zero/span, precision, calibration and audit results. These data are retained in a manner associated with the represented routine data. This information is compliant with the requirements of 40 CFR 58, Appendix A.

17.0 Reports to Management

The Environmental Data Quality Unit Supervisor produces and distributes Quality System Yearly Report to management that summarizes audit activity (systems, performance), quality assurance status, recommendations for non-critical quality assurance improvements, and any quality improvements implemented. The report summarizes activities carried out during the year, results of systems audits, comparison to DQOs, quality improvements, summary statistics, QMP/QAPP/SOP document control actions, training summary, and recommendations for future consideration to improve data quality. The annual report is made available to all staff.

17.1 External Technical Systems Audits

Reports from external technical systems audits are distributed to impacted staff including the manager(s) of the appropriate branch. Meetings are held to discuss findings, if any, and resolutions are proposed and implemented to address the findings.

The Annual Air Monitoring Network Plan is developed in accordance with 40 CFR § 58.10(a)(1) to demonstrate compliance with air monitoring network regulations, to describe proposed changes for the upcoming year, and to provide specific information on each of Minnesota's existing and proposed air quality monitoring sites.

All data submitted to AQS are certified annually in accordance with 40 CFR § 58.15. This certification is based on various reports produced in AQS that indicate whether requirements for uptime and quality assurance were met. The certification package includes a letter signed by the EAO Division Director which states that the data submitted to AQS is accurate to the best of his/her knowledge.

17.2 Internal PM2.5 Gravimetric Laboratory Audit

The MPCA Air Quality Assurance team will perform an annual PM2.5 gravimetric laboratory audit and report the results to the Environmental Data Quality Unit Supervisor and the Air Monitoring Unit Supervisor.

17.3 AQS AMP Reports

The Air Quality System (AQS) is EPA's repository of ambient air quality data. AQS provides mechanisms for the generation of quality assurance reports for each reporting organization. The Quality Assurance Coordinator will review the AMP 251 and 256 QA reports on a quarterly basis and submit the findings to Environmental Data Quality Unit Supervisor.

[i] http://www.epa.gov/air/criteria.html
[ii] https://www.revisor.mn.gov/rules/?id=7009.0080.
[iii] https://mn.gov/governor/images/EO-13-10.pdf
[iv] http://www.pca.state.mn.us/index.php/air/air-monitoring-and-reporting/air-pollution-monitoring/air-monitoring-network-plan.html
[v] http://www.epa.gov/ttn/amtic/calendar.html
[vi] https://www.law.cornell.edu/cfr/text/40/58.20
[vii] http://www.epa.gov/QUALITY/qs-docs/g4-final.pdf
[viii] http://www.epa.gov/ttnamti1/files/ambient/pm25/qa/QA-Handbook-Vol-II.pdf
[ix] https://www.revisor.mn.gov/rules/?id=7009.0080
[x] http://www.epa.gov/ttnamti1/files/ambient/monitorstrat/precursor/07workshopmeaning.pdf
[xi] http://www.pca.state.mn.us/index.php/air/air-monitoring-and-reporting/air-pollution-monitoring/air-monitoring-network-plan.html
[xii] http://www.epa.gov/ttnamti1/files/ambient/pm25/network/r-99-022.pdf
[xiii] http://www.epa.gov/quality/qs-docs/g6-final.pdf
[xivxiv] http://www.pca.state.mn.us/index.php/view-document.html?gid=19485

Document Revision Tracking

Revision Date	Old Version Number	Sections Changed	New Version number	Author

APPENDIX A: Chain of Custody Form

Minnesota Pollution Control Agency
Sample Chain of Custody Record

SHIPPING DESTINATION ____________ **RECEIVED BY** ____________________

(Return only) PM10 Filter ID	Run Date	Site No.	Filter Retrieval Date & Time	Initial Magna.	Final Magna.	Field Blank (Yes or No)

Summa ID	Pressure Initial	Final	Site No.	Run Date	Retrieval Date & Time	Total Run Time

(Return only) TSP Filter ID	Run Date	Site No.	Filter Retrieval Date & Time	Initial Magna.	Final Magna.	Field Blank (Yes or No)

TSP Clean Filters				PM10 Clean Filters			
Start ID #		End ID#		Start ID#		End ID#	

MPCA LAB shipped date ____________ **MPCA lab shipper** ________________
Shipping Company ______________ **Lab Comments** ______________________________
____

RETURN shipped date ________________ **RETURN shipper** ________________
Return Shipping Company **Field Comments**
____

MPCA Lab Received Date ________________ **Received by** ________________________